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R. H. STINCHFIELD, *Editor*
Editorial Offices: Investment Bldg., Washington, D. C.

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PUTTING UP A GOOD FRONT FOR HIS LAST APPEARANCE

Better Crops with PLANT FOOD

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VOL. XX WASHINGTON, D. C., NOV.-DEC., 1935 No. 4

Looking Backward

By Jeff McDermid

WHILE we wait for the agricultural policy of 1935 to jell in the national mold, it might be somewhat reassuring to ponder at the year's end on the rural problems, projects, and opinions which were current in this country a century ago.

With the aid of a dust mop and a considerate librarian, we find ourselves peering at the yellow pages of the middle 1830's, which by a coincidence of political history, puts us in the midst of a robust era of Jacksonian Democracy, with polished classical phrases dripping from the quill pens of plain farmers, for the eternal glory of agriculture and the rights of the common man.

Although the Ohio valley and some of the Midwest territories were slowly taking on hints of their agricultural destiny, the center of population, farm ownership, and large estates was in the South. The first railroad to carry passengers had just been started between Charleston and Hamburg, South Carolina, in 1830, with another later line to the Savannah river on which the first U. S. mails were carried behind a steam locomotive. Therefore, though we now seek in the Mississippi valley for

our representative farm thought, in 1835 it was found below the fortieth parallel and east of the ninetieth meridian.

The chief economic difference between their era and ours is that Americans could then go West when weary and distraught and start new commonwealths, and the rest of the world hadn't plastered us with their I. O. U's. Otherwise, barring the effects of a few thousand subsequent useful inventions, the human parallel is strangely familiar to ours.

WITH natural pride of craft, I point out that the chief sources of information about these rural trends of 1835 were obtainable in the limited technical farm periodicals of the times. In this country a century ago there were, quoting one of them: "No less than seven journals, all strongly striving to perfect that best of all arts, the culture of the earth, and to place it on a sure and solid foundation by scientific investigation."

By the testimony of the editors, there were circulating at the time the following general farm papers: "The New England Farmer," Boston; "The New York Farmer," New York City; "The Genesee Farmer," Rochester, New York; "The American Farmer," Baltimore; "The Western Tiller," Cincinnati; "The Western Plough Boy," Edwardsville, Illinois; and "The Southern Agriculturist and Rural Review," Charleston, South Carolina.

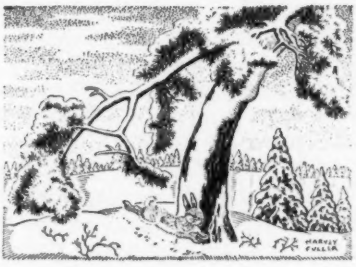
In the files I find them rejoicing that the prejudice against book-farming is rapidly fading and that "the rising generation are not willing to follow the beaten track of their fathers without finding whether they be right or not, although ready to give them all the due weight antiquity deserves." Of the seven standard farm journals circulated in 1835 perhaps the ones with heaviest frontier liabilities were the ones at Cincinnati and Edwardsville. Both were located at growing livestock markets, the one at the booming Ohio Porkopolis, and the other near the early beef-packing center of Alton in Madison county, Illinois. A few other papers and magazines claimed rural attention, but they do not reflect the keen personal comment of squires and planters found in the original papers penned by soft candlelight for these century-old rustic reviews.

To get a good preface to the thought animating the best rustic leaders of the middle 1830's, one cannot do better than to glean a choice portion of the remarks of one Francis Quash, principal speaker before the South Carolina State Agricultural Society. He indulged in all the rhetoric and Latiny allusions common to public addresses and manuscripts in that era, and he probably spent more time at the job of preparation than some of us hasty hustlers do today when called upon for like services. Leading off with reference to the Roman necessity for provisions in her warlike enterprises, he mentions the part played by the celebrated Georgic poems in arousing men to become "enamoured with rural life"—*"At prius ignotum ferro quam scindimus aequor,"* und so viter.

THEN he says that the most valuable feature of Roman farming was the uniform effort not only to perpetuate the fertility of the soil, but to improve it. "They had recourse to the expedient of resting lands," Quash said, "and returning the growth to the soil as well as their imperfect implements of husbandry would permit. They also relieved their lands by changing the grain. They ridiculed the idea of the land ever wearing out." And then he lifts a quote from some old senator: "It is neither just nor true to think that the nature of the ground, which the Creator of the Universe endowed

with perpetual fecundity, is affected with barrenness, nor does it become a wise man to believe that the earth, with a divine and everlasting youth bestowed upon it and called the common parent of all things, should grow old like a woman."

Indulging in more soil fertility reminders, the speaker admonished his audience in Charleston on that long-gone day to take heed "that the system of nature practiced in the forest must be applied by art to the fields under cultivation." By this, he said,



was meant that there must be a constant replenishment of vegetable substance, to enable the soil to endure the stimulating qualities of most artificial manures. (From all that the records show, the only artificial manures then in ordinary use were land plaster, ashes, and some saltpeter and lime, with stable manure, kitchen waste, and leaves.)

But still more pertinent for us to ponder were his remarks about "the many existing causes which retard the advancement of agriculture." Proceeding like a modern brain-truster but with far more flourish and fancy language, Quash listed the farm ills of 1835 as follows: 1—Lack of wide information and interchange of farm ideas and experiments; 2—The "embarrassed fortunes of its followers": 3—Compulsory absence from plantations to escape the "fever'n ague," or in other words, unsanitary conditions; 4—The "unwise interference of government and the unjust operation of laws"; 5—Specifically, the burdensome tariff of "abomnations" imposed about 1830 and modified by Henry Clay a few years later.

Very significant, and somewhat like our recent national experience, is the direct quotation with which we dismiss Mr. Quash and turn to others writing on kindred themes. Touching upon the debt and low finances of the planters, he said: "The prosperity which beamed on our country just after the Revolutionary War, and at a subsequent period, when the nations of the world paid us well for furnishing them with the means of destroying the resources of each other, the cheapness of credit and land enabled our predecessors to accumulate fortunes—and rocked in the cradle of wealth, habits of luxury and extravagance soon matured, casting their dark shades on the hopes and happiness of the rising generation. But the poor can never be reformers, and men of education and wealth accustomed to refinement will not, though the grim visage of bankruptcy scowls upon them."

Writing from Columbia, on the apathy which pervaded the South, another correspondent remarks: "Some who consider themselves the better class of society appear to act as though the tilling of the soil was an abject and merely mechanical calling, only allowed to exist by sufferance. Ninety-nine hundredths of the laws passed are for the benefit of the 'cits' and poor agriculture is left to shift for itself and never receives the protecting and encouraging help of government, so as to enable it to meet other professions on equal footing."

HE THEN takes up the cudgel for rural education, saying: "Are there not extensive and richly endowed institutions, with well paid professors for the promotion of useful

knowledge in divinity, law, commerce and medicine? We have some few agricultural societies in the land, but without the fostering hand of power, and without funds, what can they do? Notwithstanding all these unanswerable proofs of the worthlessness of agriculture, my habitual and rustic obstinacy will not yield, and continues refractory to the superior sense and polished reasoning of the followers of the more favored professions."

THIS writer in a caustic vein goes on to show that the city folks are indebted to farmers for everything that renders civilized man superior to the savage. He snaps out with: "The great city of Charleston itself might perceive, to its astonishment, that without the country folk back of it, it would only be a miserable village of fishermen, and as it is, its almost sole dependence for support and protection under any circumstance is to agriculture." He accuses the Charleston big-wigs of turning away European farm immigrants, allowing them to go North instead of coming to "our almost deserted middle country."

He also flings away at the consuls and diplomatic corps abroad who he claimed send all choice seeds and cuttings of tropical plants to perish in Northern hot-houses, when they might be tried with success in outdoor cultivation in the South. He is jealous of Northern achievement, concluding: "It is strange that with inferior soils and climates, our Northern neighbors are far exceeding us in the cultivation of those things for which we are so eminently situated. They are entering largely on the cultivation of the vine and the silkworm, they have large flocks of sheep, they raise a superabundance of bread, meat, horses and mules. The time is past when we in the South should be satisfied with two or three staple objects of export. We are now too passive, and calamities await us if we neglect any longer to rise up and be doing."

Although cotton had replaced indigo as a main crop, we find reference to the situation on sugar-cane plantations a century ago. In a letter to the Secretary of the Treasury, the Louisiana planters officially told about their vast enterprise and its management. There were then five kinds of cane in their fields, Creole cane, Bourbon cane from Otaheite, two varieties of riband cane, and the violet cane from Brazil. They described the five sugar kettles mounted on the furnaces, known as the great, the clean, the flambeau, the syrup, and the battery kettles. Taking a typical cane farm of 700 acres, 500 would be in the main crop and the rest in corn and beans. It required a force of 150 slaves for labor in raising the cane and making the syrup. The yield averaged 400,000 pounds of sugar, which at 5½ cents per pound yielded $22,000. This and the molasses at 18 cents per gallon made a gross estimated revenue of $25,600.

OVERSEERS' wages, and those of the engineer and sugar-maker, plus corn, feed, provisions, medicine, clothing, 15 horses, several teams of oxen, depreciation on implements, and the cost of lime, oakum, planks, and nails, totaled $10,000. The gross profit was on the supposition that the planter paid no freight, made all his own fences, his levee, casks and hogsheads, and iron work. Such a plantation located between latitude 29 and 30 was valued with improvements at $240,000. "At present cane prices, such an estate would not yield over seven per cent of its value, while the conventional interest of this state is ten per cent," the report concluded.

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Tomatoes Make Known Their Diet Needs

By M. B. Davis and H. Hill

Central Experimental Farm ,Ottawa Canada

IN a broad sense general fertilizer recommendations for various crop plants have proven of considerable value, although variations in soils and climate have at times rendered them unsatisfactory. In order to enable us to modify general treatment according to plant response influenced by soil and climate, it has been found necessary to possess a working knowledge of the interrelationship of the different elements in relation to plant response, as well as symptomatic knowledge of plants when suffering from deficiencies or excesses of specific elements.

Considerable work in nutritional studies with the tomato plant has been undertaken at the Horticultural Division, Central Experimental Farm, Ottawa, during the past six years to obtain information regarding the response to excess and deficient feeding of the various essential

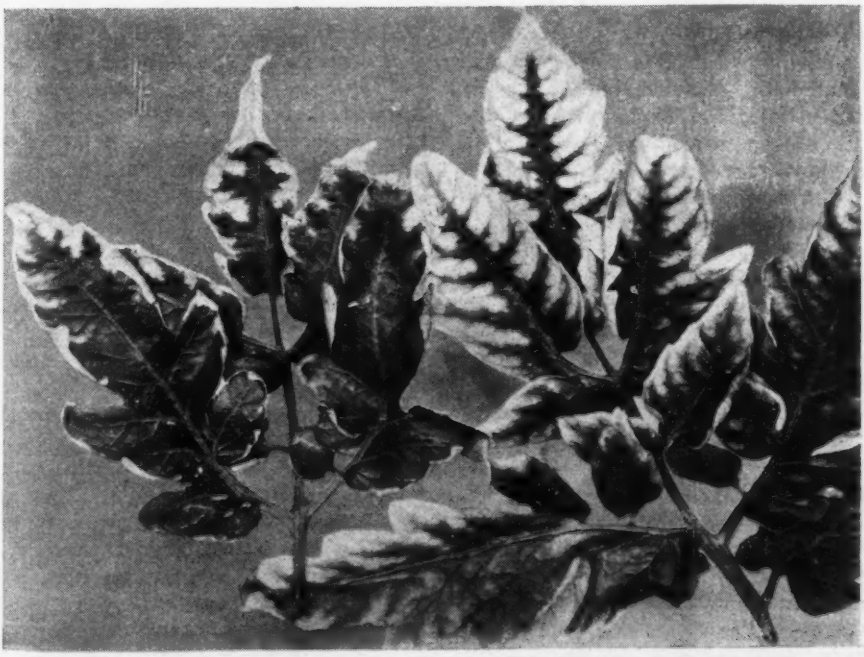

Fig. I—Chlorosis of tomato foliage caused by excessive feeding of nitrogen with insufficient potash.

elements. The studies have been conducted in pure sand cultures in pots and in beds, and as a result a considerable accumulation of interesting data has been secured, much of which is corroborative of the work of other investigators.

From these data there emerge certain plant symptoms or expressions which may be employed as a partial aid in judging the food requirements of tomato plants during growth. Some of these symptoms have been common knowledge to practical growers for years, while others have been observed from time to time but not so correctly diagnosed.

Insufficient Nitrogen

The symptoms of deficient nitrogen for instance are well known. Such plants possess a stunted appearance, slender main stems and petioles, thin leaves of a pale green or yellowish colour. These plants will quickly respond to applications of nitrogen particularly if the soil in which they are growing has an ample supply of the mineral elements.

Frequently one encounters a situation where the plant is somewhat stunted or dwarfed but the stems and petioles are reasonably stout and the foliage a medium green colour without any other signs of debility; in other words, healthy but lacking in general vigor. Such plants indicate a moderately well-balanced food supply, available, however, in too limited amount. The kind of food available is satisfactory but the quantity is insufficient. In such cases, an increase of all the major elements would be in order.

In the Ottawa experiments one of the most easily diagnosed set of symptoms has been that due to the feeding of excess nitrogen. Excess nitrogen symptoms, as will be developed later, are similar to those of deficient potassium in the early stages. There appears to exist a very close relationship between the feeding of nitrogen and the element potassium. The latter appears to act as the counterpart of nitrogen; where nitrogen promotes soft, sappy growth, potassium on the contrary hardens growth. While the symptoms of excess nitrogen do to a marked extent resemble those of deficient potassium, there is a suitable difference to be noted.

There is considerable evidence to show that luxury consumption of a nutritional element may take place, that is, the plants may absorb nitrogen in approximately the same proportion as it is available in the nutrient medium even though it is present in excess of the amount required for physiological balance. Instances of potassium deficiency are often associated with a fairly high potash level masked as it were by an excessively high nitrogen level.

Insufficient Potash

When a luxury absorption of nitrogen takes place in the presence of an otherwise ample potassium supply, the first response of the plant is that of excessive vegetative vigor, indicated by stout stems and large leaves of an abnormally dark green to bluish green colour. This is soon followed by a stage when the basal leaves are affected with a marginal chlorosis, later spreading between the veins and finally causing a burning or browning of the leaves, curling, and ultimate death. Probably by the time the lower leaves have reached the advanced chlorotic condition exhibited in Figure 1, the main stems of the plant will be exhibiting dark brown lesion-like patches which later turn black, resembling to some extent the disease known as stripe. These brown lesions or burnt patches are illustrated in Figure 2 and are particularly valuable as indicators of an excess nitrogen condition.

When such a condition exists it may be corrected by the increased

Fig 2.—A luxury feeding of nitrogen with insufficient potash will bring lesion-like patches on the stems.

feeding of potassium, that is, by the correction of the N/K ratio. The increased feeding of potassium will enable the plant to function normally insofar as vegetative production is concerned; but it has been our observation that when the level of nitrogen is such as to induce such symptoms as described above, increasing the amount of potassium, while preventing injury to the foliage and stems, results in extensive vigor and the occurrence of a large amount of blossom-end rot, which point will be developed later.

When a *real* deficiency of potassium occurs in the presence of a moderate nitrogen supply, the plants do not possess the initial high vigor produced by luxury feeding of nitrogen. In fact, growth is poor, the plants somewhat stunted, the foliage dark green but individual leaves not large. Later the margins of the lower leaves become chlorotic similar to excess nitrogen symptoms but the stem lesions do not occur. The chlorosis of the leaves progresses inwards between the veins, ultimately resulting in severe scorching or browning and the death of the leaf. As the plant progresses, injury spreads upwards until in severe cases only the new foliage is free of trouble. In extreme cases of potassium deficiency the yellowing of the leaf margins may be followed by a purpling of the under side and a curling downward toward the stem.

A somewhat similar condition to the above may be brought about by the excess feeding of phosphorus, for an excess supply of this element may actually bring about a potassium-deficient condition in the plant. The earlier symptoms of excess phosphorus feeding are a general yellowing of the leaf (see Figure 3), followed by the appearance of white speckles or large necrotic areas similar to potassium-deficient symptoms reported by Janssen & Bartholomew but never obtained by us except in the presence of excess phosphorus. Upon the death of the affected leaf

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The Inquiring Mind *and the* Seeing Eye

By Alister B. Alexander

Madison, Wisconsin

"SO FAR as I know, I have never heard an individual say an unkind thing about him, nor he an unkind thing of another individual. At the same time, he does not hesitate to present his own ideas and to battle for them in a fair and considerate manner."

This is the word picture of the character of Professor D. R. Hoagland of the University of California, painted by his friend and associate, Dr. A. R. Davis, Professor of Plant Physiology at the same institution.

Early Education

Dennis Robert Hoagland, Chairman of the Division of Plant Nutrition at the College of Agriculture, Berkeley, California, was born at Golden, Colorado, on April 2, 1884, the son of Charles B. and Lillian Burch Hoagland. His father, born in Kentucky of Dutch ancestry, and his mother, a native of Colorado but of English ancestry, passed on to him a sturdy foundation for the character that invoked the tribute quoted above.

Dennis Hoagland received his early education in the grammar and high schools of Denver, and then entered Stanford University, where he majored in Chemistry and graduated with the A.B. degree in 1907. While an undergraduate his marks entitled him to entry into Phi Beta Kappa, and gave an indication at that time of the brilliant mind that was later to be so helpful to his native state, and to the other states in which he has worked and experimented.

After his graduation he spent one semester in graduate work at Stanford as an assistant in chemistry; then came an appointment as an instructor and laboratory assistant in the laboratory of animal nutrition, under the late Professor Jaffa, in 1908. Following this training period, he became an analyst, then an expert chemist and Consulting Scientific Expert for the Referee Board of the United States Department of Agriculture, during the period from 1910 to 1912. During this time he was associated with Dr. Alonzo Taylor in his work on the toxicity of aluminum, copper, and sulphur compounds. These compounds were being employed at that time in fruit processing and as preservatives. and, under the influence of Dr. Wiley, the Referee Board was set up to determine whether such compounds had any deleterious effect on human metabolism.

In order to adequately test the toxicity of these compounds, a so-called "poison squad" was formed, composed of volunteer pre-medical students at the University of California. The work was carried on there in 1910, and in 1911-1912 at the

University of Pennsylvania, with Professor Hoagland acting as expert chemist in connection with the experiments. After the completion of the work of the Referee Board, Professor Hoagland went to the University of Wisconsin, where he received his master's degree in 1913, with his thesis on "The Influence of Sodium Benzoate on the Synthesis of Urea." The same year he was appointed Assistant Professor at the University of California, in the

PROFESSOR D. R. HOAGLAND

newly organized Division of Agricultural Chemistry, under Professor John S. Burd.

During the war period he particularly concerned himself with the problem of potassium storage in sea weed, the extraction of which added considerably to the nation's potash supply. In 1922, the Divisions of Agricultural Chemistry and Soil Chemistry and Bacteriology were combined into the Division of Plant Nutrition, with Professor Hoagland as head.

At about this time he set out to study the problem of absorption of ions by plants, a field in which he since has become the leader. In this work, he adopted the broad viewpoint embodied in a concept of plant-soil interrelations. He was interested in soil as supplying minerals to the soil solution, and he was interested in the plant as absorbing from that soil solution. He early discovered that if important progress were to be made, more quantitative methods of study were imperative. He therefore set out to control the experimental conditions so that the results of his studies might more accurately be interpreted.

Professor Hoagland has contributed many papers to this field of study, and these contributions have been made use of both by plant and animal workers over the entire world. During this period of great activity in research, he still found time to guide the work of many graduate students, some of the most outstanding younger men in America having come under his influence.

Exceptional Executive

Professor Hoagland has an exceptional ability in organization of research programs and in the analysis of data resulting from research work. He also has the ability to summarize decisively the outstanding points in the research work of others. This is especially shown by him in many of his summary articles, and in his position as Associate Editor of the Annual Review of Biochemistry.

His achievements have been recognized by his selection as the guiding officer of many different national organizations, such as the Western Society of Soil Science (1924); Pacific Division, American Botanical society (1929); Western Society of Naturalists (1931); American Society of Plant Physiologists (1932); and others, culminating in his recent selection as Vice-President of the Section of Plant Physiology at the Sixth International Botanical Congress at Amsterdam in 1935. He

also was awarded the Stephen Hales Award for distinguished contributions to plant physiology, presented by the American Society of Plant Physiologists in 1930, and has recently been selected for membership in the National Academy of Sciences.

Practical in Research

Professor Hoagland combines a knowledge of the theoretical with an appreciation of the practical to a degree unusual in the research worker. His understanding of the practical problems of plant nutrition which confront the agriculturist in California, combined with his sound theoretical knowledge, has gone far toward a solution of many perplexing problems. This is illustrated by his recent work on the relation of zinc to the little-leaf of peach and the mottle-leaf of citrus. In collaboration with Professor W. H. Chandler he has worked out practical methods for the solution of this fascinating problem.

Another problem combining theoretical with practical knowledge was in connection with "tip-burn" of the prune. This baffling trouble, in certain localities in California, was found to be associated with potassium deficiency in the soil, and not with an organism, as had long been supposed. Many other so-called "deficiency" diseases have been and are being studied by Professor Hoagland.

Published writings of Professor Hoagland have been varied and of great value to the agricultural interests of the nation. In 1915 he wrote several articles concerning the organic constituents of Pacific coast kelps, and the complex carbohydrates and forms of sulphur found in marine algae. In the following years he issued "Acidity and Absorption in Soils as Measured by the Hydrogen Electrode," and an important article on "The Effect of Hydrogen and Hydroxyl-ion Concentration on the Growth of Barley Seedlings."

His later writings have covered "The Freezing Point as an Indication of Variations in the Soil Solution Due to Season and Crop Growth;" "The Relation of Plants to the Reaction of the Nutrient Solution;" "The Effect of Certain Aluminum Compounds on the Metabolism of Man;" "Effect of Season and Crop Growth on the Physical State of the Soil;" "The Soil Solution in Relation to the Plant."

Others include "The Feeding Power of Plants;" "A Comparison of Sand and Solution Cultures with Soils as Media for Plant Growth;" "Minimum Potassium Level Required by Tomato Plants Grown in Water Cultures;" "Little-leaf or Rosette in Fruit Trees;" "Nutrition of Strawberry Plant under Controlled Conditions;" and several important contributions concerning the absorption of ions, in which field, as previously stated, he is a leader.

A Man of Promise

Although his achievements seem ample, Professor Hoagland is still a comparatively young man, and will undoubtedly add a great deal more to the agricultural and soil knowledge of California and of the United States. He was married in 1920 to Jessie Smiley, whose sudden death from pneumonia in 1933 saddened her family and her wide circle of friends. Fortunately, she left three fine boys to be companions to their father, and to grow to respect his knowledge and character, of which Dean C. B. Hutchinson says, "I have long admired his unusual ability to analyze intricate and difficult problems and then direct toward their solution the modes of attack and techniques of the physical and botanical sciences. In all of my educational and research experience, I have never known a man who could do this better than he. For this reason I regard Dennis Hoagland as one of the most outstanding men in agricultural science today."

New Laws, New Ideas New Enterprises

By G. Chalmers McDermid

Charleston, South Carolina

SOME years ago, when the United States Department of Agriculture placed an embargo on the importation of certain flower bulbs from Holland, J. M. Harrison, vegetable grower of Charleston, S. C., conceived the idea that bulbs would be a paying venture on his farm. Accordingly, he contacted bulb importers and Department of Agriculture officials and started his crop, in a small way, off in one corner of his farm. From this beginning of a few acres in 1922, he has gradually increased his plantings to 40 acres last season, and it is this figure that he intends holding as his limit.

Mr. Harrison has left the bulb growing entirely to his brother-in-law, James W. Geraty, who besides growing from 100 to 150 acres of potatoes, spinach, squash, cabbage, and beans, still has time to talk about his bulbs. "If I have a hobby," says Mr. Geraty, "that hobby is bulbs, not only because they make such a beautiful showing during the growing season, but because they answer so readily to any treatment I give them."

The prevalent soil type on the Harrison farm is Norfolk sandy

Fields of narcissi like this lend a reason for the name of the farm—"Harrison's Pleasure Grove Farm."

loam, in which the bulbs seem to make their best growth. While Mr. Geraty has used both the heavier and the lighter soil types for bulbs in years gone by, experience has shown him that the loamy type gives him best results. This soil is well-drained and warms up rapidly during the winter months, and so he has relegated the other fields to the growing of truck crops.

Increased Potash Application

Planting usually begins in October. "Earlier planting," says Mr. Geraty, "gives us as good a stand, but we find that the longer the bulbs are in the ground, the more chance there is of a certain kind of second growth which causes them to split into smaller sizes, and this cuts down the number of marketable bulbs. I lay off my fields in 2½ foot rows, apply from 1,000 to 1,500 pounds of 4-8-8 (NPK) fertilizer in the rows, and stir well with my cultivators. After a few days in the soil, preferably after a light shower, I freshen the ground again with a light plow and plant."

When questioned as to why he had settled on his fertilizer analysis and rate of application, Mr. Geraty stated that he had started out in an experimental way, with applications of from 1,500 to 3,000 pounds of 8-7-5 fertilizer, thinking that nitrogen was the big element needed. Finding that these amounts of nitrogen were too much, he cut the applications down to 1,500 pounds of 5-7-5. Later, through much correspondence with the Department of Agriculture and others, he still further cut the nitrogen to 4 per cent and increased his potash to 8 per cent. Since that time he has been well satisfied with results, although he still feels that he could cut his nitrogen down another per cent and "get away with it."

Sometimes he follows potatoes or cabbage with his bulbs. Then he is able to cut the nitrogen down to 2 per cent, feeling sure that the amount of this plant food left over in the soil is sufficient to give his plants enough to carry them through. He has grown bulbs for as many as five years in succession in the same fields and says that they are managing to hold their own. He feels that this is a bad practice, however, because they will eventually exhaust certain essential plant foods and hurt the land.

"Phosphorus and potash seem to be the limiting factors for bulbs on my soil," says Mr. Geraty, "because I can't get satisfactory crops without them, especially the potash. I find that I can get away without nitrogen at all or just a little of it for a season or two, but a complete fertilizer running 3-8-8 or 4-8-8 is the best. When I have this analysis mixed, I insist that all nitrogen come from organic sources, such as cottonseed meal, fish meal, or blood, and the potash from manure salts or muriate of potash."

Insects do not bother this planting, and each year the State Crop Pest Commission gives it a clean bill of health. Thus is done away with the necessity of either treating the bulbs at planting time or fumigating the marketable bulbs at selling time.

Quality Brings Good Prices

Digging season comes in June, the tops beginning to die down in May. "Tater" digging also comes in late May and June, and Mr. Geraty is sometimes in a quandary as to which he shall dig first. "Taters will rot," says he, "if you leave them too long, and nature put a coat on narcissus bulbs which keeps them safe, so I always get the spuds first."

Prices received have been satisfactory, according to Mr. Geraty, except for the last year or so. He has been shipping his bulbs into most of the important Eastern and Midwestern cities, and his customers nearly al-

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John Jackson and Son, Colebrook, N. H., have twice won cups with yields like these.

Learning *from* Club Yields

By Ford S. Prince

Agronomist, New Hampshire College of Agriculture

WE HAD a selfish motive in promoting New Hampshire's 300-bushel potato club. To the growers it may have appeared that the object of this effort was to reward them with suitable insignia when they produced the desired yield. But our real reason was to inquire into the methods they used to produce large yields of potatoes, for we have always believed that, within certain limits, big yields and low costs go hand in hand. This certainly means more profit on the potatoes that are grown.

Most of these men, who have succeeded in making the grade, by virtue of growing more than 300 bushels of potatoes per acre on a three-acre tract, are not average farmers. They are, in the main, much better than that. They are a keen, wide-awake group; men who drive, some of them, 100 miles or more to attend a meeting if they believe that there they will get an idea that will help them improve their methods. This they have done, as evidenced by the fact that the state record has crept steadily from slightly less than 400 to 532 bushels per acre, and with a significant increase in the average yield of the growers as a whole.

An explanation of how these growers produce high yields, the methods they employ, and how they have changed their fertilizer practices, seed usage, rotation methods, and spray programs to keep in the forefront in

the potato game is the object of this article.

The rotation system followed on most farms has been the greatest weakness of these potato growers. They are used to long rotations, with the land down many years in hay, and it was not easy to shorten the cropping practice, until the wireworm menace came into the foreground. These insects infest old sod lands and cause damage to the potato stand as well as to the quality of the potatoes produced. Except by shortening the rotation, it is practically impossible to control these pests. That the growers are attempting to avoid wireworm dangers is borne out by the fact that in 1934 only 25 per cent of them used old sod land for spuds. In 1932, 40 per cent planted their crops on old sod land, and in the earlier years of the club, the percentage planted on old sods was even higher.

Another method of avoiding wireworms is to use the land for potatoes two or more years. In 1932 one out of twelve growers followed this method; in 1934 one in five planted potatoes on land that had been in potatoes the year before. While this does not necessarily shorten the rotation, it does avoid wireworm injury, as the damage the second year is always less than it was the first, even where the land is infested, due to the fact that many of the wireworms have emerged as click beetles. As the adults lay their eggs only in sod land, no new infestation occurs in land that is not down in hay.

Aside from quality due to the presence or absence of wireworms, the rotation followed has had an effect on yield wherever a clover sod is utilized for the potato crop. On farms where a short rotation has been practiced by members of this club and where a clover sod has been utilized, the average yield has been 427 bushels per acre, while the average yield on all the other farms has been but 376 bushels.

Yields in our New Hampshire club have not run as high as in many other states. In our club, a member must have at least three acres in order to enter, and yields are checked on this three-acre tract. This means in almost every case that the contest area is not loaded but is representative of the methods used on all the growers' acreages. Although a farmer has a right to select the three acres where the yield is to be checked, it is the exception rather than the rule to have him choose the area for taking records. We believe this keeps the club within the realm of practicability and the methods followed by the members applicable on many of our farms.

Mr. Jackson gives much attention to quality as well as yields.

One very definite result that has been obtained amongst the men who have entered the club is securing a better stand of potatoes. Due to the yield aim, the average width of row has been narrowed from 36 to about 34 inches, and the potatoes now are spaced closer in the row. The net result is the use of more seed potatoes per acre, and this is one of the trends that has become evident. In the early years 15 bushels of seed were the rule. The amount used has increased each year, until in 1934 the average was 19.4 bushels per acre. What the final outcome in this respect will be, we do not know. It is quite apparent that the maximum has not yet been reached, and early reports from the 1935 crop indicate that the average may run well over 20 bushels of seed per acre this year. It now has been firmly established that good yields are possible only with good stands and that labor, fertilizer, and spray material are wasted on a poor stand of potatoes.

These potato growers are not stingy with fertilizer. They believe thoroughly in applying abundant plant food so that the crop will never be hungry during the season. Although the amounts applied have varied slightly, depending largely on the price received for the preceding crop, there has been a tendency to increase the plant food. The amount jumped from 1,960 pounds in 1929 to an average of 2,280 pounds in 1934, when the fertilizers used were all reduced to a 20-unit basis. Better soils, rotations, and methods permit of the use of more fertilizer with profit. Although certain experimental work that we have done in New Hampshire, work which these growers are keenly following, does not indicate abundant profits in applying more than one ton of 20-unit plant food or its equivalent, it is quite apparent that these men are not allowing their crops to suffer for want of something to eat.

Potato growers "turn out" at the field meetings held during the growing season.

The formula of the fertilizer that is used is receiving more and more attention from the potato growers. With experimental work as a background, they have learned that certain soils require more phosphoric acid than is found in the ordinary formula. Old sod lands where plant-

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Discing down bur clover preparatory to bedding the land for planting cotton.

Winter Covers *for the* South

By E. B. Ferris

Extension Agronomist, Mississippi State College

THE older parts of the cotton belt boast of mild winter temperatures and a high annual rainfall. Properly taken advantage of, these factors might have proven blessings; but under the prevailing system of growing clean-cultured crops, like corn and cotton, they have, in fact, contributed largely to a rapid wearing out of the soils as a result of heavy winter rains falling on bare fields. In the more northern latitudes of the United States such rapid loss of plant food has not taken place even under a like system of clean-cultured crops because the lands freeze in winter and much of the precipitation comes as snow rather than rain.

It is estimated that several times as much plant food has been lost to the South from erosion and leaching as has ever been removed in crops. One has only to observe the millions of acres of gullied and abandoned fields in our section to be convinced that this estimate is not an exaggeration. Not only have the gullied hillsides themselves been destroyed, but inert subsoil material from them has covered even larger areas of once fertile bottom lands, filling up drainage ditches and obstructing the flow of natural creeks, and even rivers.

Of course, the mechanical protection of these hillsides with proper terraces is of first importance, but alone will never entirely correct the trouble because sheet erosion, while not so evident to the eye as actual gullying, is still as potent a factor in removing plant food. It may be said here that the South as a whole was never more erosion-conscious than now, following the intense campaign that has been going on recently in Soil Erosion stations and our many CCC Camps. Therefore, the time seems ripe to stress other factors that must be considered if our southern fields are again to be brought back to their once productive state when they rivaled any part of the civilized world in the crops produced.

The factors that have contributed most to a rapid wearing-out of these soils, namely, open winters and heavy rainfalls, might be made assets in growing more winter cover crops. These crops will prevent erosion and leaching and at the same time furnish winter grazing for livestock, and when turned under in the spring will add much humus to the soil, as well as nitrogen, if they are legumes. That our people are not all unaware of this fact is proven by the record in many of these states. As an illustration, the state of Alabama has a record of having planted only 50,000 pounds of winter legumes in 1918 and having increased this amount to some 6,500,000 pounds in 1934. To this time vetch and winter peas have been used more largely than any other kinds and their use is being greatly increased, not alone by intensive campaigns put on by the Experiment Station and Extension forces, but as well by the general knowledge among farmers, after seeing the results of their neighbors, that the growing of such crops pays wonderfully well.

While the vetches and winter peas will likely continue to be the most popular of these winter legumes, some wonderful results have been had in certain parts of the cotton belt from the use of bur clover as a cover crop following cotton or corn. Bur clover has long been used in the South as an early pasture plant and has one decided advantage over vetch and winter peas in its ability to produce abundantly seed which may be saved at small cost by the farmer. Too, when once well seeded, the seed ger-

An excellent crop of vetch is one of the most popular of the winter legumes.

minate slowly and enough seed will remain ungerminated in the soil to continue to give stands over a period of four or five years. Thus, in the Mississippi Delta certain planters have found that by letting a single heavy crop of this clover go to seed, they may continue to get stands for five successive winters even where these stands are plowed under in the spring before being given time to make seed. Such fields are watched, and where the stands begin to get poor, the crop is allowed to reseed, thus growing another abundant supply. These fields are then planted to late corn rather than cotton and are continued in the clover over an indefinite period.

A committee of planters studying a good growth of bur clover being used as a winter cover crop.

One of the greatest deterrents to the more general use of these winter legumes is the cost of annual seeding, which cost mounts to several dollars per acre for seed and inoculation alone, besides the expense of actual planting. If it proves practical to substitute over a wide area bur clover for vetch or winter peas, it will prove a great boon to the farmer. However, the cost of starting the planting of bur clover is much higher than with vetch or peas, because 8 to 10 bushels of seed in bur are required to plant an acre and they do not germinate so well nor as quickly as do the more commonly grown winter legumes. But the seed in the burs carry their own inoculation and while they sell for approximately $1.00 per bushel on the markets, they can be saved at home by the simple process of sweeping them up in the spring at the low cost of two to three cents per bushel for actual labor. A single acre well developed will furnish enough seed for planting 10 or more acres.

In Mississippi, numbers of farmers are planting small lots of this bur clover with the expectation of allowing it to seed and from this small start gradually increase their plantings as seed are available and the general knowledge of the crop is increased. In other parts of the state, crimson clover is being used to a limited extent for winter cover and has given fine results, but it, like vetch and winter peas, requires annual seeding and usually out-of-pocket money for purchasing seed and inoculating material. While vetch reseeds itself fairly well and has been known to perpetuate itself in a field

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"Man Cannot Live By Bread Alone"

By C. J. Chapman

Soils Department, University of Wisconsin

I AM going to relate a soil fertility story that illustrates well the quotation from the Bible which I have used as title to this article.

I have in mind right now a large farm, some 1,200 acres, located at Oconomowoc, Wisconsin. This farm is owned by Fred Pabst of Blue Ribbon fame—fame gained both through his blue ribbon Holsteins and Blue Ribbon Beer. Some five years ago Mr. Pabst, through his manager F. J. Southcott, appealed to the Soils Department for help. Something was wrong with the soils on this farm. Crop yields had been slipping for several years.

It was in the fall of 1929 that I first visited this farm. I made a complete soil survey, taking samples of soil from the various fields on the farm. We tested these soils in our laboratories for acidity, available phosphorus, and available potash. We also ran greenhouse pot tests on representative samples from two of the fields on the farm where we planned to conduct field trials the year following. Our chemical tests and greenhouse results clearly indicated an unbalanced state of fertility.

I checked up on the previous history of this farm and found that practically every acre of tillable land had been limed. I found further that several carloads of rock and superphosphate had been used, and literally trainloads of feed concentrates had been purchased and fed to the large herd of dairy cattle on the farm.

Our laboratory tests on soil samples, our greenhouse pot tests, and the history of the fertilization, all pointed toward a potash problem. Of course, the lime-phosphate program

Potash paid on barley on the Fred Pabst farm, Oconomowoc, Wis. An 0-20-10 fertilizer increased the yield 5.6 bushels per acre in one of the driest seasons in history. Net profit from the treatment was $2.70 per acre. Superphosphate alone increased the yield 2.5 bushels per acre with a net profit of $.05.

had temporarily stimulated crop production, but all the time the reserves of potash were being lowered. The feeding of so much grain and other feed concentrates had tended still further to accentuate this potash shortage.

Mr. Pabst is one of the early graduates of the Short Course in Agriculture of the University of Wisconsin, and at the time he was a student our program for lime, phosphates, and legumes seemed to be fundamentally sound. Most of the soils of the state by chemical analyses showed tremendous reserves of total potassium, and we had little thought that potash would ever become a limiting element.

Crop Showed Potash Hunger

The soil on the farm has been mapped largely as Waukesha silt to fine sandy loam. For the most part it is a level terrace, underlain at a depth of two feet or more with a gravelly, silty clay, and on some portions with a sandy subsoil. This type of soil, even under average farming practice, has shown response to potash fertilizers in recent years.

In the spring of 1930, we laid out some large 3-acre plots on an 80-acre field of barley. We used straight superphosphate and compared this treatment with mixtures, with nitrogen and potash in varying proportions. The results of this first year's field trial and of subsequent tests have verified my suspicions that the lack of potash was largely responsible for the lowered productiveness of this land.

I recall vividly that first spring in 1930 an 80-acre field of alfalfa which showed in a most striking way the characteristic symptoms of potash hunger. The crop was stunted in growth. The leaves showed white flecks in their margins and the lower leaves were yellow and dried up prematurely, both symptoms indicating potash starvation.

We tried an experiment on this field. After the first crop of alfalfa was harvested, we made two rounds with a broadcast fertilizer sower across the entire length of the field, using on one strip pure 50 per cent muriate of potash and on the other strip an 0-20-20 mixture.

Very little benefit could be seen on the second crop that year, but the following spring those two strips in this field stood out head and shoulder above the rest of the field. Not only was there a marked difference in the growth of the alfalfa on these two strips, but we found that there had been less winter-killing where the potash fertilizer had been used.

In 1931 Mr. Pabst purchased a carload of superphosphate and potash fertilizer (10 tons each of 45 per cent superphosphate and muriate of potash.) In fact, he has been buying phosphate-potash fertilizers every year since, and it would do your heart good to see the alfalfa on this farm at the present time. No longer is there any evidence of potash starvation on fields which have been fertilized, but rather big, rank, dark green, thrifty, beautiful stretches of this great hay crop.

Varied Amounts of Potash

Last year Mr. Pabst became very much interested in the use of fertilizers on malting barley. He purchased a large 16-disc combination fertilizer drill, and on our recommendation purchased enough potash-phosphate fertilizer to cover 105 acres. We conducted some experiments on one field of barley to check the influence of varying amounts of potash in mixtures with phosphate on the malting quality of barley.

It is well known that the season 1934 was the driest in history in Wisconsin. Yields were cut short by reason of a lack of moisture and intense heat. In spite of the unfavorable season, however, there was a

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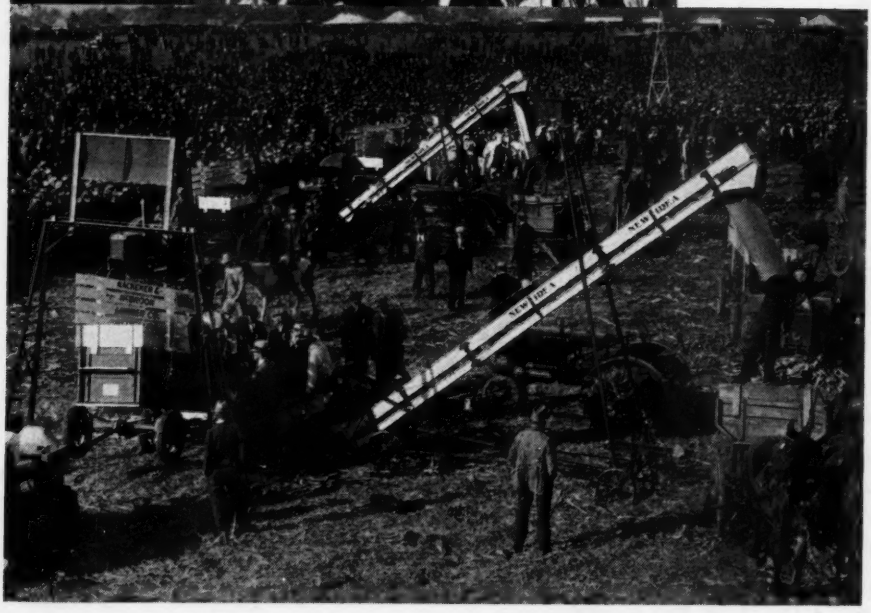
Pictorial

NOT A CREATURE WAS STIRRING.

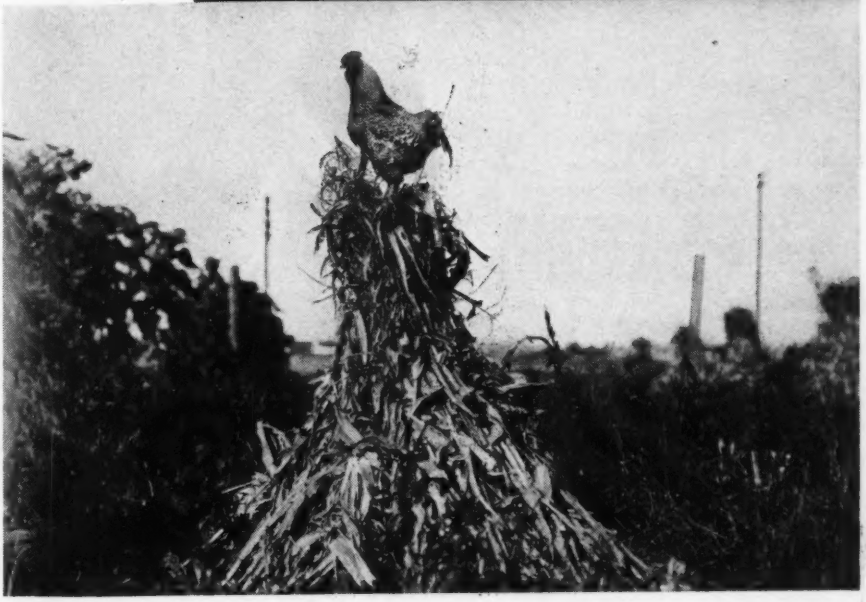
King of the Corn-huskers – Elmer G. Carlson, 26-year-old farmer from Audubon, Iowa, won this year's National Corn-husking Contest, recently held at Newton, Indiana. He set a new world's record by husking 41.5 bushels in the allotted 80 minutes.

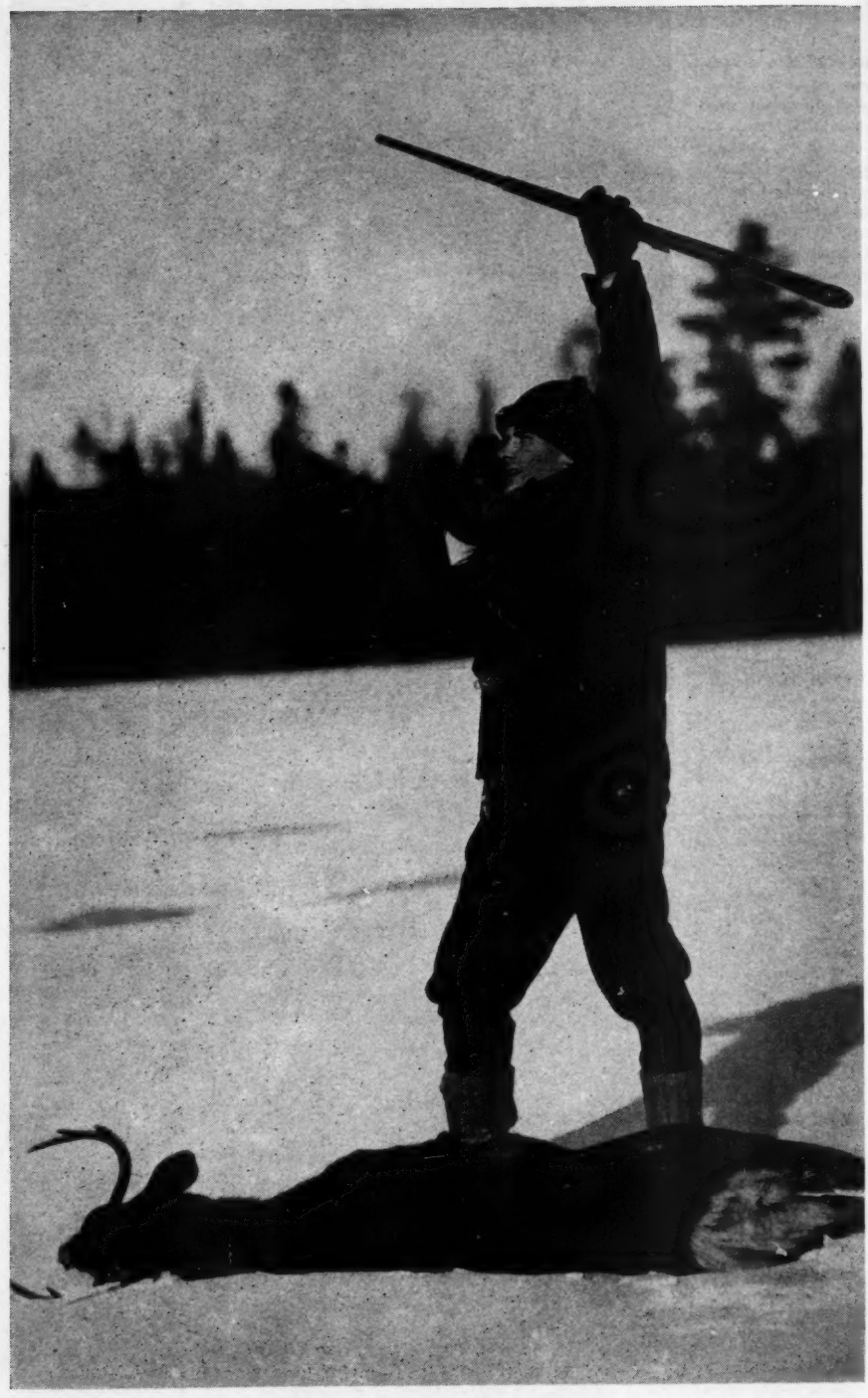
Below: Interested Spectators.



Queen of the Muck Crops Show – Miss Evelyn Edwards was crowned "Queen" at the Northern Indiana Muck Crops Show held this fall at North Judson, Indiana. She competed with 20 other girls from surrounding communities to win this honor.

Below: Royalty, Self-crowned.





WHEN HUNTERS BREAK SILENCE

The Editors Talk

Christmas Spirit

Again we are at the end of another year. Mental and actual inventories of accomplishments of the aims and purposes with which we set forth on our living of 1935 flood upon us. To some there will come a degree of satisfaction; to others disappointment. Both will merge into a joyous Christmas Spirit if we will but open our hearts to it.

What is the source of the Christmas inspiration? What makes a sane and blase world prepare for the "holly day" in the same excited and happy way year after year? What makes an essentially and materially-minded people forget self in a furtherance of "Good Will Toward Men?"

It is, of course, the Christian significance. And yet, isn't there also evident the very human need of a means of clarifying our lives and putting ourselves in tune with a brotherhood out of which progress only can come?

We need a time to pause and check up. We need a time to forget our worries and cares. We need a time to fully appreciate our human relationships. We need the humbleness of the Christmas spirit. Let us imbide to the fullest extent possible.

Right Application Means More Profit

Several million tons of commercial fertilizer are applied to our farm lands every year. There is a right and a wrong way of applying this fertilizer to the land. The best methods of application mean larger yields and cheaper costs of production. Careful experimental work has shown that potatoes yield 20 to 25 more bushels per acre, corn 5 to 10 bushels, cotton 100 to 200 pounds more seed cotton per acre, and some other crops in proportion, if proper methods of application are used. Hence experimental work in this field is of much practical importance.

Investigations were started by the formation of a committee in the fall of 1925. During 1926-27-28 a number of cooperative experiments were conducted. A more comprehensive program, involving the use of machines in contrast to the old method of application by hand, was started in the spring of 1929 in South Carolina. During 1929 and 1930 the fertilizer and farm equipment industries contributed a substantial sum to cover expenses incidental to getting the program started.

Since 1931 the Bureau of Agricultural Engineering has expended in its

cooperative work with the committee and with State Experiment Stations somewhat more than $100,000. During that time a number of experimental machines have been developed and a laboratory building was erected at Arlington Farm. The Bureau of Plant Industry and the Bureau of Chemistry and Soils and many State Agricultural Experimental Stations have contributed much to this cooperative program. The fertilizer industry is represented on the Joint Committee on Fertilizer Application. R. H. Smalley of the National Fertilizer Association is General Secretary.

The experiments in fertilizer application so far have been made on cotton, corn, tobacco, potatoes, cabbage, peas, tomatoes, snap beans, canning corn, lima beans, kale, spinach, sugar beets, and white beans. Experimental work to date has shown that the method of applying fertilizer to potatoes, for instance, in the bottom of the row mixed well with the soil, does not on the average produce the best yields. For practically all crops that have been under investigation, the work has given conclusive proof of the value of applying fertilizer in bands at the sides of the hill or row.

In addition to the work on methods, the farm-equipment industry has made distinct progress in developing new machines and attachments for old machines in order that fertilizer may be applied in accordance with the recommendations of the committee.

The results already obtained are of great value in the more efficient use of fertilizers. Further work should be heartily supported by everyone interested, to the end that where better practices are demonstrated, they may be put into general use for the betterment of all concerned.

Conserve the Soil

"Conservation of Our Natural Resources" is a term known to almost everyone. However, to most "Our Natural Resources" mean minerals, oil, gas, forests, and water power. Too few include what is now being emphasized as our most *important* natural resource—the soil.

"As a nation we have been blind to the need for conservation of our soil. Apparently we have felt that like Tennyson's brook which runs forever, the soil is imperishable and will continue to support plant growth," says Dr. J. S. Buie, formerly Chief Agronomist, Clemson College, S. C., and now a Regional Director of the Soil Conservation Service. He points out the danger in such an attitude by declaring that whether one does or does not own land, he is concerned in maintaining the productiveness of the soil. Every man, woman, and child in the United States is affected either directly or indirectly by the problem of soil conservation. It is not just an agricultural problem, but one of far-reaching economic and social significance, for it is impossible to substitute any other medium for soil in the culture of plants, without which human and animal life could not long continue.

It is gratifying to have Dr. Buie also say that the growing interest in the problem by the general public and the active participation in control measures by diversified groups are most encouraging.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

A very interesting discussion of the geology of the soils in the state of Massachusetts as related to reserves of soil potash and the economical use of potash salts in crop fertilization is to be found in the new Agricultural Experiment Station Bulletin, No. 324, "Potash in Massachusetts Soils—Its Availability for Crops." Chemical analyses of soil samples from the 10 major soil series reveal quite a wide variation in total potash, higher percentages frequently being associated with higher content of silt-clay particles. On the average the percentage of potash in the silt-clay particles is only slightly higher than in the sand particles. Since the soils average about 75 per cent sand, much of the soil potash is contained in these sand particles. Probably the potash in this large percentage of sand is not as available as that contained in the smaller silt-clay percentage. In the opinion of the author, efficient use of fertilizer potash on these soils requires careful consideration of the soil texture and water supply. An abundance of water will enable a crop to make use of more of the soil potash, while with a scanty water supply, there is need for liberal use of easily dissolved potash fertilizers. Soil research workers and agronomists working with soils of a glacial origin should find this bulletin most helpful.

Bulletin No. 322, Massachusetts Experiment Station, "The Effect of Fertilizers on the Longevity of Mowings," is a report of experiments with varying amounts of N, P, & K on Merrimac fine sandy loam. In this work nitrogen was the most effective nutrient in producing differences in yield, with potash a close second. Increments of phosphoric acid were of no value in increasing yield. The results show a superior type of vegetation, particularly with respect to clover, on the plots which received high potash, while on the high-nitrogen plots there was a slightly higher percentage of the better grasses. High-nitrogen, high-potash fertilizers in a 3-1-2 ratio, in the opinion of the authors, should produce the best yield and quality of hay. They specifically point out that fertilization alone does not insure permanency of mowing, but rather does it prolong the period of profitable production. This bulletin is a most valuable contribution to our knowledge of hay-land management and fertilization.

"Effects of Certain Soil Types, Seasonal Conditions, and Fertilizer Treatments on Length and Strength of Cotton Fiber," Agr, Exp. Sta., Fayetteville, Ark., Bul. 319, June 1935, O. A. Pope.

"Fertilizers for Potatoes," (Second Report) Agr. Exp. Sta., Storrs, Conn., Bul. 203, May 1935, B. A. Brown.

"Vegetable Fertilizers with Special Emphasis on Home Mixing," St. Col. Ext. Serv., Storrs, Conn., Bul. 215, Feb. 1935, Albert E. Wilkinson.

"Borax as a Fertilizer for Celery," Agr. Exp. Sta., Gainesville, Fla., Pr. Bul. 478, Aug. 1935, E. R. Purvis and R. W. Ruprecht.

"Commercial Fertilizers," Agr. Exp. Sta., Lafayette, Ind., Cir. 212, Apr. 1935, H. R. Kraybill, O. W. Ford, O. S. Roberts, L. E. Horat, M. H. Thornton, C. M. Cohee, and J. W. Jackman.

"Soil Management and Fertilizers for Indiana Fruit Crops," Purdue Univ., Lafayette, Ind., Leaf. 185, Rev. Apr. 1935, Monroe McCown.

"Report of the Fruit and Truck Experiment Station, Hammond, La.," Agr. Exp. Sta., Hammond, La., Issued 1935, B. Szymoniak.

"Inspection of Commercial Fertilizers for 1934," Agr. Exp. Sta., Durham, N. H., Bul. 283, Dec. 1934, T. O. Smith and H. A. Davis.

"Fertilizer Experiments with Sweet Clover," Agr. Exp. Sta., Durham, N. H., Sta. Cir. 47, May 1935, F. S. Prince, P. T. Blood, T. G. Phillips, and G. P. Percival.

"Top-Dressing Pasture Lands with Fertilizer," Agr. Exp. Sta., Durham, N. H., Sta. Cir. 48, Apr. 1935, F. S. Prince, P. T. Blood, T. G. Phillips, and G. P. Percival.

"Fertilizer Report, 1934," Pa. Dept. of Agr., Harrisburg, Pa., Vol. 18, No. 4, Gen. Bul. 530, June 1, 1935.

"Recommendations with Reference to the Fertilization of Flue-Cured, Sun-Cured and Shipping Tobacco Grown on Average Soils in Va., N. C., S. C., and Ga. for the Year 1936," Sept. 1, 1935.

"Analyses of Commercial Fertilizers," Agr. Exp. Sta., Clemson, S. C., Bul. 304, Aug. 1935.

"The Fate of Added Barium Silicofluoride and Its Effect upon Sulfates and Other Soil Components, as Influenced by Limestone and by Dolomite," Agr. Exp. Sta., Knoxville, Tenn., Bul. 155, June 1935, W. H. MacIntire, W. M. Shaw, and Brooks Robinson.

"Commercial Fertilizers," Agr. Exp. Sta., Burlington, Vt., Bul. 397, Aug. 1935, L. S. Walker and E. F. Boyce.

"Boron in Soils and Irrigation Waters and Its Effect on Plants, with Particular Reference to the San Joaquin Valley of California," U. S. D. A., Washington, D. C., Tech. Bul. 448, Feb. 1935, Frank M. Eaton.

Soils

An ingenious chart showing the influence of soil reaction on the availability of mineral nutrients and other elements of importance in plant nutrition has been devised by N. A. Pettinger. This chart is incorporated in a bulletin describing in non-technical language the meaning, significance, and system of expressing soil reaction. The importance of soil reaction on the availability of a number of beneficial and non-beneficial elements in the soil is briefly discussed, and the suitable soil reactions for a number of field and garden crops are given. A very helpful table, which tells how much lime to apply to change the reaction (pH) of the soil a desired range, is included.

The author has wisely drawn attention to the limitations of benefits that may be expected from bringing the reaction of the soil to the proper range. Liming is not a cure-all for the non-productivity of soils. Proper fertilization, drainage, organic matter, and other factors also are important in producing good yields, and it is only by giving proper attention to all these factors that best yields of high-quality crops are obtained. However, soil acidity is a very important factor in the humid sections and best returns from fertilizers will not be obtained if the soil reaction is not favorable.

Farmers and those advising them will find this practical bulletin very useful. It is published by the Virginia Agricultural Experiment Station as Extension Bulletin 136, entitled "A Useful Chart for Teaching the Relation of Soil Reaction to the Availability of Plant Nutrients to Crops."

"The Measurement and Significance of Hydroxyl-ion Concentration in Alkaline-Calcareous Soils," Col. of Agr., Tucson, Ariz., Tech. Bul. 57, June 1935, W. T. McGeorge.

"The Use of Sugar Beet Petioles as Indicators of Soil Fertility Needs," Colo. Exp. Sta., Fort Collins, Colo., Tech. Bul. 14, July 1935, Robert Gardner and D. W. Robertson.

"Soil Erosion in Missouri," Col. of Agr., Columbia, Mo., Bul. 349, Apr. 1935, L. D. Baver.

"Soils in Relation to Fruit Growing in New York, Part VI. Tree Behavior on Important Soil Profiles in the Williamson-Marion Area, Wayne County," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 626, Apr. 1935, Joseph Oskamp.

"Soils in Relation to Fruit Growing in New York, Part VII. Tree Behavior on Important Soil Profiles in the Kinderhook, Germantown, and Red Hook Areas in Columbia and Dutchess Counties," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 627, Apr. 1935, L. P. Batjer and Joseph Oskamp.

"Field Crops on Berks Shale Soil Respond to Lime and Fertilizers," Va. Agr. Exp. Sta., Blacksburg, Va., Bul. 292, *Nov.* 1933, *P. T. Gish and T. B. Hutcheson.*

"Pasture Irrigation," Agr. Exp. Sta., Pullman, Wash., Bul. 313, *May* 1935, *L. J. Smith, Maynard S. Grunder, and Harry L. Garver.*

"Selenium and Other Toxic Minerals in Soils and Vegetation," Agr. Exp. Sta., Laramie, Wyo., Bul. 206, *June* 1935, *O. A. Beath, H. F. Eppson, and C. S. Gilbert.*

"Soil Blowing and Dust Storms," U.S.D.A., Washington, D. C., Misc. Pub. 221, *Mar.* 1935, *Charles E. Kellogg.*

"Chemical Studies of Infertile Soils Derived from Rocks High in Magnesium and Generally High in Chromium and Nickel," U.S.D.A., Washington, D. C., Tech. Bul. 471, *Apr.* 1935, *W. O. Robinson, Glen Edgington, and H. G. Byers.*

"Soil Survey of Perry County, Alabama," U.S.D.A., Washington, D. C., Series 1930, *No.* 30, *J. F. Stroud, M. E. Stephens, M. E. Swann, G. A. Swenson, W. E. Tharp, and B. H. Williams.*

"Soil Survey of the Brighton Area, Colorado," U.S.D.A., Washington, D. C., Series 1932, *No.* 1, *W. G. Harper, Lloyd Acott, and Elmer Frahm.*

"Soil Survey of Benewah County, Idaho," U.S.D.A., Washington, D. C., Series 1930, *No.* 22, *E. N. Poulson and K. B. Platt.*

"Soil Survey of Monroe County, Iowa," U.S.D.A., Washington, D. C., Series 1931, *No.* 9, *C. L. Orrben and W. E. Tharp.*

"Soil Survey of Iowa, Poweshiek County," Agr. Exp. Sta., Ames, Iowa, Soil Sur. Rep. 74, *Mar.* 1935, *P. E. Brown, T. H. Benton, H. R. Meldrum, and A. J. Englehorn.*

"Soil Survey of Iowa, Guthrie County," Agr. Exp. Sta., Ames, Iowa, Soil Sur. Rep. 75, *Mar.* 1935, *P. E. Brown, C. L. Orrben, H. R. Meldrum, and A. M. O'Neal.*

"Soil Survey of Iowa, Hancock County," Agr. Exp. Sta., Ames, Iowa, Soil Sur. Rep. 76, *Mar.* 1935, *P. E. Brown, H. R. Meldrum, T. H. Benton, and G. B. Killinger.*

"Soil Survey of Iowa, Washington County," Agr. Exp. Sta., Ames, Iowa, Soil Sur. Rep. 77, *Mar.* 1935, *P. E. Brown, C. L. Orrben, H. R. Meldrum, and A. J. Englehorn.*

"Soil Survey of Woodson County, Kansas," U. S. D. A., Washington, D. C., Series 1931, *No.* 8, *M. H. Layton and C. E. Dornberger.*

"Soil Survey of Neosho County, Kansas," U. S. D. A., Washington, D. C., Series 1930, *No.* 33, *M. H. Layton, R. W. O'Hara, and C. E. Dornberger.*

"Soil Survey of Tillman County, Oklahoma," U. S. D. A., Washington, D. C., Series 1930, *No.* 24, *A. W. Goke, E. G. Fitzpatrick, and W. C. Boatright.*

"Soil Survey of Randall County, Texas," U. S. D. A., Washington, D. C., Series 1930, *No.* 27, *E. H. Templin and T. C. Reitch.*

"Soil Survey of Galveston County, Texas," U. S. D. A., Washington, D. C., Series 1930, *No.* 31, *Z. C. Foster and W. J. Moran.*

Crops

The Agricultural Extension Service of Ohio State University has recently revised and brought up to date several of its best publications. Among those in the listings below are such subjects as "Growing Vegetable Plants," "Tomatoes for Canning," "Home Gardening," "Lawns," and "Better Pastures for Ohio Livestock." These publications make available for handy reference in one volume basic information with which many readers are familiar and all new data on the subjects involved.

An important winter crop is house plants. While usually of greatest interest to women, this crop occasions many inquiries to agricultural extension workers with reference to satisfactory cultural practices. A new bulletin, No. 206, "House Plants," by E. R. Honeywell, Department of Horticulture, Purdue University Agricultural Experiment Station, is detailed in its information on essentials of plant growth, plant containers, insects and allied pests, selection of house plants, care of greenhouse-grown plants, and other related subjects. Not only agricultural extension workers but every housewife who is interested in brightening up her windows will find this publication full of practical advice.

"The Quality of Arizona Cotton," Agr. Exp. Sta., Tucson, Ariz., Bul. 150, *June* 1, 1935, *R. L. Matlock and J. R. Kennedy.*

"Annual Report of the Director for Fiscal Year Ending June 30, 1934," *Agr. Exp. Sta., Newark, Del., Bul.* 192, *May* 1935, *C. A. McCue.*

"Growing and Handling Sweet Potatoes in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 55, *Rev. May* 1935, *D. R. Porter.*

"The Farm That Became a College," Univ. of Calif., Berkeley, Calif., Third Series, Vol. XXVIII, No. 16, *May* 15, 1935.

"Effects of Certain Environmental Factors on Germination of Florida Cigar-Wrapper Tobacco Seeds," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 277, *May* 1935, *Randall R. Kincaid.*

"Effects of Freezing Temperatures on Sugarcane in the Florida Everglades," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 278, *May* 1935, *B. A. Bourne.*

"The Digestible Nutrient Content of Napier Grass Silage, Crotalaria Intermedia Silage and Natal Grass Hay," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 279, *May* 1935, *W. M. Neal, R. B. Becker, and P. T. Dix Arnold.*

"The Tung-Oil Tree," Agr. Exp. Sta., Gainesville, Fla., Bul. 280, (*Revision of Bul.* 221) *June* 1935, *Wilmon Newell, Harold Mowry, R. M. Barnette, Rev. by A. F. Camp and R. D. Dickey.*

"Composition of Miscellaneous Tropical and Sub-Tropical Florida Fruits," Agr. Exp. Sta., Gainesville, Fla., Bul. 283, *July* 1935, *A. L. Stahl.*

"Cotton Varieties for Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 285, *Sept.* 1935, *W. A. Carver.*

"The Iodine Content of Some Georgia Vegetables and Water as a Factor in Its Variation," Ga. Exp. Sta., Experiment, Ga., Bul. 190, *May* 1935, *K. T. Holley, T. A. Pickett, and W. L. Brown.*

"Science Aids Idaho Farmers," Annual Report, Agr. Exp. Sta., Moscow, Idaho, Bul. 217, *June* 1935.

"Lespedeza in Illinois," Agr. Exp. Sta., Urbana, Ill., Bul. 416, *July* 1935, *J. J. Pieper, O. H. Sears, and F. C. Bauer.*

"More and Better Potatoes," Purdue Univ., Lafayette, Ind., Ext. Bul. 89, *May* 1935, *W. B. Ward, C. T. Gregory, and C. E. Gould.*

"4-H Corn Club Manual," Purdue Univ., Lafayette, Ind., Ext. Bul. 157, *Mar.* 1935, *A. T. Wiancko and W. R. Amick.*

"Peach Pointers," Purdue Univ., Lafayette, Ind., Ext. Bul. 171, *Mar.* 1935, *Monroe McCown.*

"Indiana Baltimore Tomato—Its History and Development," Agr. Exp. Sta., Lafayette, Ind., Cir. 207, *Dec.* 1934, *Edw. C. Stair.*

"Helps for the Home Garden," Purdue Univ., Lafayette, Ind., Rev. Ed., May 1935.

"Korean and Other Lespedezas," Purdue Univ., Lafayette, Ind., Leaf. 175, *Apr.* 1935, *K. E. Beeson.*

"Growing Tomatoes for the Early Market," Purdue Univ., Lafayette, Ind., Leaf. 182, *Apr.* 1935, *W. B. Ward.*

"Currents and Gooseberries," Purdue Univ., Lafayette, Ind., Leaf. 193, *Apr.* 1935, *Clarence E. Baker.*

"Extension Progress," St. Col. Ext. Serv., Manhattan, Kan., Ext. Bul. 75, *Dec.* 1934, *H. J. C. Umberger.*

"Forty-Seventh Annual Report of the Director for the Year 1934," *Agr. Exp. Sta., Lexington, Ky., Jan.* 1, 1935, *Thomas P. Cooper.*

"Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1933–1934," *Agr. Exp. Sta., Baton Rouge, La., J. Mitchell Jenkins.*

"A General Summary of Experiments with Sugarcane," Agr. Exp. Sta., Baton Rouge, La., Bul. 267, *Aug.* 1935, *W. G. Taggart, C. B. Gouaux, E. C. Simon, C. W. Edgerton, E. C. Tims, P. J. Mills, W. E. Hinds, and B. A. Osterberger.*

"Nitrogenous Metabolism in Irish Potatoes during Storage," Agr. Exp. Sta., College Park, Md., Bul. 372, *Jan.* 1935, *Neil W. Stuart and C. O. Appleman.*

"Permanent Pastures in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 373, *Feb.* 1935, *Fred V. Grau.*

"Onions in the Connecticut Valley," Agr. Exp. Sta., Amherst, Mass., Bul. 318, *May* 1935, *A. B. Beaumont, M. E. Snell, W. L. Doran, and A. I. Bourne.*

"Pruning Bearing Apple Trees," Agr. Exp. Sta., Amherst, Mass., Bul. 320, *June* 1935, *J. K. Shaw.*

"The Field Station Journal," Field Sta., Cedar Hill, Waltham, St. Col. Ext. Serv., Amherst, Mass., Nos. 145, 146, *and* 147.

"The Influence of the Length of the Interval Between Pickings on the Yield and Grade of Pickling Cucumbers," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 259, *Aug.* 1935, *H. L. Seaton.*

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 18, *No.* 1, *Aug.* 1935.

"Forty-First Report," Agr. Exp. Sta., University Farm, St. Paul, Minn., July 1, 1932 *to June* 30, 1934, *Andrew Boss.*

"Minnesota Agricultural Experiment Station, 1885–1935," *Agr. Exp. Sta., University Farm, St. Paul, Minn., Bul.* 319, *May* 1935, *Andrew Boss.*

"An All-Year Pasture System for Missouri," Agr. Exp. Sta., Columbia, Mo., Cir. 186, *May* 1935, *W. C. Etheridge, C. A. Helm, and E. Marion Brown.*

"Good Pastures Improve the Pig Crop," Agr. Exp. Sta., Columbia, Mo., Cir. 187, *June* 1935, *A. G. Hogan and S. R. Johnson.*

"Agricultural Research in New Hampshire," Annual Report 1934, *Agr. Exp. Sta., Durham, N. H., Bul.* 284, *Apr.* 1935, *J. C. Kendall, Director.*

"Orchard Practice," Univ. of N H. Ext. Serv., Durham, N. H., Ext. Bul. 47, *June* 1934, *G. F. Potter, L. P. Latimer, C. O. Rawlings, and E. J. Rasmussen.*

"Extension Work in New Hampshire 1934," *Univ. of N. H., Durham, N. H., Ext. Bul.* 48, *Mar.* 1935, *J. C. Kendall, Director.*

"Relief Gardens in New Hampshire— 1934," *Univ. of N. H. Ext. Serv., Durham, N. H., Ext. Cir.* 164, *Feb.* 1935, *J. C. Kendall, Director.*

"Top-Grafting Fruit Trees," Univ. of N. H. Ext. Serv., Durham, N. H., Ext. Cir. 166, *Mar.* 1935, *G. F. Potter, L. P. Latimer, and C. O. Rawlings.*

"The Home Vegetable Garden," Univ. of N. H. Ext. Serv., Durham, N. H., Ext. Cir. 170, *May* 1935, *J. R. Hepler.*

"A Study of the Factors Affecting the Development of the Embryo-Sac and the Embryo in the McIntosh Apple," Agr. Exp.

Sta., Durham, N. H., Tech. Bul. 61, *May* 1935, *Louis R. Bryant.*

"Fifty-Fifth Annual Report of the N. J. State Agricultural Experiment Station and the Forty-Seventh Annual Report of the N. J. Agricultural College Experiment Station for the Year Ending June 30, 1934," *Agr. Exp. Sta., New Brunswick, N. J., Jacob G. Lipman.*

"Yarding Systems and Crop Rotations for Poultry Farms," Agr. Exp. Sta., New Brunswick, N. J., Cir. 357, *June* 1935, *Howard B. Sprague.*

"Fifty-Sixth Annual Report," for Fiscal Year Ending June 30, 1933, *and Progress Report for Year Ending Dec.* 1, 1933, *Agr. Exp. Sta., Raleigh, N. C., R. Y. Winters.*

"Approved Practices for Alfalfa Growers," Agr. Exp. Sta., State College Station, Raleigh, N. C., Bul. 300, *Sept.* 1934, *P. H. Kime and H. B. Mann.*

"Growing Fruit in North Dakota," Agr. Exp. Sta., Fargo, N. D., Bul. 280, *Mar.* 1935, *A. F. Yeager.*

"Growing Vegetable Plants," Agr. Col. Ext. Serv., Columbus, Ohio, Bul. 103, *Mar.* 1935, *E. B. Tussing, J. H. Boyd, and I. P. Blauser.*

"Tomatoes for Canning," Agr. Col. Ext. Serv., Columbus, Ohio, Bul. 114, *Rev. Feb.* 1935, *E. R. Lancashire, T. H. Parks, and A. L. Pierstorff.*

"Home Gardening," Agr. Ext. Serv., Ohio St. Univ., Columbus, Ohio, Bul. 116, *Rev. Apr.* 1935, *E. R. Lancashire.*

"Lawns," Agr. Col. Ext. Serv., Columbus, Ohio, Bul. 129, *Rev. Mar.* 1935, *George M. McClure, C. J. Willard, and F. A. Welton.*

"Alfalfa in Ohio Farming," Agr. Ext. Serv., Ohio St. Univ., Columbus, Ohio, Bul. 137, *Rev. Mar.* 1935, *R. D. Lewis, J. A. Slipher, and C. J. Willard.*

"Sudan Grass, Soybeans, and Other Emergency Hay and Pasture Crops," Agr. Col. Ext. Serv., Columbus, Ohio, Bul. 151, *Rev. Apr.* 1935, *Earl Jones, E. D. Lewis, and D. R. Dodd.*

"Better Pastures for Ohio Livestock," Agr. Ext. Serv., Ohio St. Univ., Columbus, Ohio, Bul. 154, *Rev. Sept.* 1935, *D. R. Dodd and R. M. Salter.*

"Filler Apple Trees," Agr. Exp. Sta., Wooster, Ohio, Bul. 551, *July* 1935, *C. W. Ellenwood.*

"Feeding Pigs on Forage," Agr. Exp. Sta., Wooster, Ohio, Bul. 552, *Aug.* 1935, *W. L. Robison.*

"Handbook of Experiments in Agronomy," Agr. Exp. Sta., Wooster, Ohio, Sp. Cir. 46, *June* 1935.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XX, No. 175, *July-Aug.* 1935 *and No.* 176, *Sept.-Oct.* 1935.

"Forty-Seventh Annual Report," Agr. Exp. Sta., Kingston, R. I., Cont'b. 467, *Apr.* 1935.

"Growing Asparagus," Agr. Ext. Serv., College Station, Texas, C-82, 1935, *J. F. Rosborough.*

"Demonstration Outline for Irish Potato Production," Agr. Ext. Serv., College Station, Texas, C-85, 1935, *R. R. Reppert.*

"Watermelon Demonstration," Agr. Ext. Serv., College Station, Texas, C-87, 1935, *R. R. Reppert.*

"Cantaloupes," Agr. Ext. Serv., College Station, Texas, C-90, 1935, *R. R. Reppert.*

"Forty-Eighth Annual Report, 1934–1935," *Agr. Exp. Sta., Burlington, Vt., Bul.* 396, *July* 1935, *J. L. Hills.*

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 329, *Aug.* 1935; *Bul.* 330, *Sept.* 1935; *and Bul.* 331, *Oct.* 1935.

"Some Factors Affecting the Influence of Soybeans, Oats, and Other Crops on the Succeeding Crop," Agr. Exp. Sta., Morgantown, W. Va., Bul. 265, *Apr.* 1935, *D. R. Dodd and G. G. Pohlman.*

"Science Safeguards," Annual Report 1933–1934, *Agr. Exp. Sta., Madison, Wis., Bul.* 430, *June* 1935, *Chris L. Christensen.*

"Strawberry Culture in Wisconsin," Col. of Agr., Madison, Wis., Cir. 268, *Mar.* 1934, *James G. Moore.*

"Distance of Planting Rural New Yorker No. 2 *and Triumph Potatoes as Affecting Yield, Hollow Heart, Growth Cracks, and Second-Growth Tubers," U. S. D. A., Washington, D. C., Cir.* 338, *Feb.* 1935, *W. C. Edmundson.*

"Report on the Agricultural Experiment Stations, 1934," *U. S. D. A., Washington, D. C., Aug.* 1935, *J. T. Jardine and W. H. Beal.*

Economics

Potato growers interested in factors affecting farm income will find Bulletin 378 of the Maine Agricultural Experiment Station, entitled "A Study of the Organization and Management of Potato Farms in Aroostook County, Maine," full of valuable information. It is pointed out by the author, William E. Schrumpf, that the factors influencing most the labor income are size of business, yield rate of potatoes, and man-labor efficiency. As the number of acres, yield rate, and number of acres per man increased, there was a significant increase in labor income per farm. The author also emphasizes the fact that there has been a decided trend toward the use of higher analysis fertilizer. For example, the long popular 5-8-7 analysis, which in 1928 represented 60.3 per cent of the total tonnage

on the 165 farms surveyed, had decreased by 1930 to 32.4 per cent. During the same period the 6-9.5-8.5, 5-7-10, and 10-16-14 analyses showed an increase of around 100 per cent in tonnage used.

"Georgia Land Use Problems," Ga. Exp. Sta., Experiment, Ga., Bul. 191, May 1935, *W. A. Hartman and H. H. Wooten.*

"Index Numbers of Idaho Farm Prices," Agr. Exp. Sta., Moscow, Idaho, Bul. 210, June 1935, *C. O. Youngstrom.*

"Cost of Production in Agriculture," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 184, *June* 1935, *John A. Hopkins and Paul A. Taylor.*

"Economic Phases of Erosion Control in Southern Iowa and Northern Missouri," Agr. Exp. Sta., Ames, Iowa, Bul. 333, *June* 1935, *Rainer Schickele, John P. Himmel, and Russell M. Hurd.*

"Production of Crops and Livestock on the Newlands Project in 1934," *Agr. Exp. Sta., Reno, Nev., Bul.* 138, *March* 1935, *F. B. Headley.*

"An Economic Study of Grape Farms in Eastern United States, Part II. Harvesting and Marketing," Agr. Exp. Sta., Ithaca, N. Y., Bul. 628, April 1935, G. P. Scoville.

"Land Use in Pennsylvania," Pa. State Col. Exp. Sta., State College, Pa., Bul. 317, *May* 1935, *Paul I. Wrigley.*

"Regulations of the Secretary of Agriculture under the United States Grain Standards Act," U. S. D. A., Washington, D. C., Serv. and Reg. Announcements 148, *Effective July 1,* 1935.

U. S. Farm Map Changed

CHANGES in the agricultural map of the United States, especially in the last half century, are easily evident. But the part that improved machinery has had in these changes is not so well known, says S. H. McCrory, Chief of the Bureau of Agricultural Engineering of the United States Department of Agriculture.

Wheat lands considered as unprofitable 30 years ago have become profitable through low cost production—largely because of the development of tractors and combines. Since 1915 there has been a general decline in wheat acreage east of the Mississippi, but the acreage has increased in Texas, Oklahoma, Kansas, Colorado, North Dakota, and Montana.

The Central Great Plains is more completely suited to extensive livestock farming because development of the combine led to the breeding of a dwarf grain sorghum—a low-cost grain when harvested with a combine. A man with a team will harvest not more than 2 acres a day of grain sorghums. But a 15-foot combine with 2 men will harvest and thresh 20 to 25 acres a day.

Combines also are making large acreages of soybeans especially profitable in the Corn Belt. Development of silage machinery makes it possible to turn the coarse, low-cost, low-producing forage crops of the Great Plains into palatable winter feeds. With modern hay machinery the Mississippi Valley farmer has increased his hay acreage.

While cotton acreage in South Carolina, Georgia, and Alabama was shrinking, it was expanding on less productive lands in Texas and Oklahoma, where yields are comparatively low but net profits are high because of low cost production with machinery.

The first result of improved agricultural machinery was larger farms and large machinery. But now the trend is towards adapting mechanical equipment to the small farm. The one-plow tractor and the small combine harvester are examples.

"New machines and improvement of present day machinery," says Mr. McCrory, "probably will continue to make changes in locations where crops can be most profitably grown and even in the kind of crops produced."

Silt Fills Man-Made Lakes

CITY people as well as farmers lose from soil erosion. Uncontrolled water not only removes tons of valuable topsoil from farms each year but it puts this soil into lakes and reservoirs used for water and power supplies. Many such reservoirs, built usually at high cost, in a few years will be filled with silt, rather than water, according to studies by the Soil Conservation Service of the United States Department of Agriculture.

This washing of topsoil usually is due to bad grazing, farming, and forestry practices in the watershed contributing to the reservoir—practices which have removed a vegetative cover and induced gullying and sheet erosion.

The Soil Conservation Survey gives these examples of man-made lakes which are rapidly filling: The Rogers Reservoir at Rogers, Tex., in 12 years has lost nearly one-fourth its storage capacity because of silting. Lake Waco, at Waco, Tex., in 5 years has lost more than 12 percent of its capacity. The reservoir at Spartansburg, S. C., in 8 years has lost more than 17 percent of its capacity. The efficiency of the Great Morgan Falls Reservoir near Atlanta "has been practically ruined due to the collection of silt and clay above the dam. Only the stream channel is open." The huge San Carlos Reservoir on the Gila River in Arizona in a little more than 6 years has lost nearly 3 per cent capacity.

Terracing, contour farming, strip cropping, gully control, more grass crops, and the planting of oversteep lands to permanent grass or tree crops retard erosion and will retain most of the silt now filling reservoirs, say soil conservation workers.

Fertilizer Makes Legumes Better Nitrogen Factories

LEGUMES are natural nitrogen factories—but their production may be increased with the use of phosphorus and potash.

Many farmers grow legumes as green manure crops because they collect nitrogen from the air and put it into the soil. Applications of phosphorus and potash to legumes stimulate their growth enabling them to produce more nitrogen than if they did not receive these fertilizer materials. These are not wasted as they are available for the next crop as corn or cotton when the legumes are plowed under and decay.

By this method the farmer gains the use of three fertilizer materials although he applied only two.

Phosphorus and potash applied to legumes when grown as a green manure crop help to produce heavier yields of corn and other crops than if the same fertilizer is applied directly to the crops, tests of the United States Depaitment of Agriculture show. In the South, fertilizer mixtures of 0-10-4 and 0-8-4 applied at the rate of 400 pounds an acre are generally satisfactory for increasing the growth of the Austrian winter pea and other legumes grown as a green manure crop preceding corn and cotton.

Indian Summer Results From Whims of Weather

"INDIAN summer," according to the United States Weather Bureau, is one of those picturesque traditions, no one knows just how or when. Meteorologists have never really defined the term, but they consider it to have more foundation in fact than such purely fanciful weather ideas as the one about the groundhog.

The ideal Indian summer, the official weathermen say, is a tranquil period—with little or no wind, with much hazy sunshine, and with temperatures well above normal, though not as high as in the real summer. It sometimes follows cold, stormy, somewhat unseasonable weather the latter part of September, in October, or even in November. Some autumns—about one-fourth of them—have no very definite Indian summer; others have two or three periods that might qualify as such.

The so-called "Indian summer" is the result of a strong, persistent high atmospheric pressure along the Gulf and South Atlantic coasts and out over adjacent waters. This high pressure forces cyclonic, or widespread storms to take a more northerly course than usual, and their centers to pass along the northern boundary of the United States. Thus an almost continuous flow of warm southern air is drawn into northern territory. The haziness in Indian summer air is due to soil dust, smoke, and particles of dead leaves that rise readily with occasional gusts of wind, and remain long suspended because there is no rain to wash them out.

Fruit Growing in Canada

FRUIT growing is an important branch of Canadian agriculture, embracing a wide range of fruits from hardy northern berries to peaches and grapes. Many kinds of fruit are successfully grown in many sections of the Dominion, but fruit growing as a commercial industry is limited to rather well-defined districts, these being principally the Annapolis Valley in Nova Scotia, the southern half of Ontario, and the valleys of British Columbia. The valley of the Saint John river in New Brunswick produces apples on a commercial scale, and there are parts of Quebec where apple growing is successfully practiced on a commercial scale.

In Nova Scotia, the apple-growing industry has assumed great importance, the bulk of the crop being annually exported to Great Britain. The first experimental commercial shipments of apples to England from the Annapolis Valley were made in 1861. Up to 1890 production of apples in Nova Scotia rarely exceeded 100,000 barrels, but after that date there was a pronounced increase in acreage and production, and in 1909 the production reached a million barrels. A record crop of about 1,900,000 barrels was produced in 1911, and further records were made in 1919 when the gross crop exceeded 2,000,000 barrels.

Apple growing in Quebec dates back to 1663, and it is in this province that the celebrated Fameuse

apple is thought to have originated. The capabilities of Quebec for the production of apples of the finest appearance and of the best quality are very great, but at present there are not sufficient apples grown for the local demand.

In Ontario, where the commercial production of all kinds of fruit that can be successfully cultivated in Canada has reached its highest development, apples have been grown from the middle of the eighteenth century. Commercial orcharding has developed only within the past fifty or sixty years and was only made possible when the building of railways permitted trees and fruits to be transported rapidly. In addition to apples, peaches, pears, plums and cherries, small fruits and grapes are produced upon a large scale in the Niagara fruit-growing district.

In British Columbia commercial fruit growing is of comparatively recent origin, but the development of commercial orcharding has been very rapid, especially during the last ten years. The most noted fruit district is that of the Okanogan Valley. Pears, plums, peaches, apricots, cherries and small fruits are also grown on a large scale.

Good Tobacco Crops

ONTARIO'S 1935 flue tobacco crop will go on record as one of the brightest colored, as well as one of the largest tobacco crops, ever produced in the province. From the standpoint of quality the crop is the best since 1932, and there have been few tobacco crops produced in Ontario that would equal it as a whole.

The estimated total acreage of flue tobacco in Ontario is 31,000 acres as compared with 24,000 acres in 1934. The average yield is placed at 925 pounds per acre, producing a total crop of 28,675,000 pounds; in 1934 the production was 21,860,000 pounds. The acreage of burley, which declined between 1931 and 1934, was expanded greatly this year and is placed at slightly above 9,000 acres, compared with some 6,800 acres in 1934. The average yield of burley is estimated between 1,200 and 1,300 pounds per acre, resulting in an output of approximately 11,250,000 pounds compared with 7,950,000 pounds last season. It is an excellent crop and is curing up well. The 2,000 acres of dark tobacco also show good yield and quality.

Man Cannot Live by Bread Alone

(*From page* 22)

marked response to the fertilizer treatment. On our plots we used straight 20 per cent superphosphate, an 0-20-10, 0-20-20, and straight potash (20 per cent Kainit). All fertilizers were applied at rates of about 250 lbs. per acre with a combination fertilizer drill. The fertilizer was drilled in direct contact with the seed. Acre plots were used, running the entire length of the field. These plots were separated by blank strips 18 inches wide, to facilitate accurate harvesting.

The plots were harvested and threshed separately. Weights were taken of the grain as it came from the fields before threshing, and records kept both of weight of straw and weight of grain.

The 0-20-10 plot gave the largest net returns ($2.70 per acre). We observed, however, that in the case of the 0-20-20 there was some firing or burning, probably due to the extreme dry, hot weather. I am still of the opinion that had the season been normal, the 0-20-20 plot would have shown the largest yield.

Malting tests were made on barley from the various plots, but by reason of the dry season very little difference in quality could be determined.

Still Investigating

On the basis of our tests in 1934, Mr. Pabst used this year the 0-20-10 mixture on 275 acres of barley, applying at rates of from 140 to 150 pounds per acre with combination fertilizer drills. Tests are being repeated on one of the fields to check once more the influence of varying amounts of potash, not only on yields but on the malting quality of the barley. Moisture conditions have been favorable so far, and at this writing, June 17, the 0-20-20 plot is showing up best.

You may ask, why not use some nitrogen in the mixture? Frankly, I'm afraid to recommend nitrogen on this farm. Mr. Pabst can grow plenty of straw in a normal year, and the addition of nitrogen may result in decreased yields if weather conditions are unfavorable at the finish. In fact, we have tried nitrogen in our mixtures in previous years, and this year we have a 4-20-10 plot in comparison with the 0-20-10. It may prove profitable, but with a high level of nitrogen on this farm, we believe that year in and year out it is safest to omit the nitrogen.

It is my belief that in normal years a 1:1 ratio of phosphoric acid to potash will prove most profitable, both from the standpoint of yields and malting quality, and also influence on legume seedings.

It is a surprising and interesting thing to note that even though the level of phosphorus on the soils of this farm is high, the barley crop seems to respond to and requires phosphorus as well as potash for maximum results. Where alfalfa is being seeded, with barley as a nurse crop, we are recommending somewhat higher ratios of potash to phosphoric acid.

What we have learned of the need for potash on the Pabst Farm is true of thousands of other farms in Wisconsin and other states. The liming of our soils and the continued use of phosphates are bound to accentuate the need for potash. There is no one program of soil fertility that is going to work under all conditions. A fact today may be a fallacy tomorrow. We have no sooner patched up one weak link in the chain than another one develops. But it's true that we must maintain a balanced state of fertility in our soils if we would harvest maximum yields.

New Opportunities

"Man cannot live by bread alone," nor can plants live by lime or phosphorus alone. Many of the soils that we thought were sufficiently well supplied with potash to last for hundreds of years to come are now responding profitably to potash fertilization. Our knowledge of the plant-food requirements of crops and of the plant-food limitations of our soil is still meager, but we are learning more every year. Larger numbers of carefully conducted demonstrations and field trials over a period of years will result in new and startling discoveries. And it looks now as though we are going to have to start all over again in many of our experimental plots, and include mixtures carrying some of these so-called rare elements, particularly magnesium, copper, manganese, and even iron and boron.

I am satisfied that in Wisconsin there is still an almost untouched field of educational work to be done in getting our farmers to use potash

where potash is needed; phosphates where phosphates are needed; nitrogen where nitrogen is needed; and combinations of these fertilizing elements where combinations are needed. There are thousands of acres of land in this and other states where crops growing on them are hungry and crying for plant food. There are thousands of farmers who in their smug complacency are content to follow along with the same old system, completely asleep and unaware of their opportunity. It is a challenge to the extension workers in crops and soils to arouse our farmers to their opportunities—an unending task and unlimited field of endeavor.

Tomatoes Make Known Their Diet Needs

(*From page* 9)

areas instead of turning dark brown as in the case of excess nitrogen or deficient potassium, they turn a whitish yellow colour.

Phosphorus deficiency is indicated by a stunting of the growth and small-sized leaves dull green or greenish brown in colour which later turns to a purple or bluish purple.

Plants receiving excess or luxury potassium feeding tend to be slender in growth, leaves are spaced farther apart, and the foliage is somewhat lighter green than exhibited by balanced feeding. In extreme cases there is a mosaic-like mottling of the lower leaves sometimes accompanied by dull purple spotting or patches.

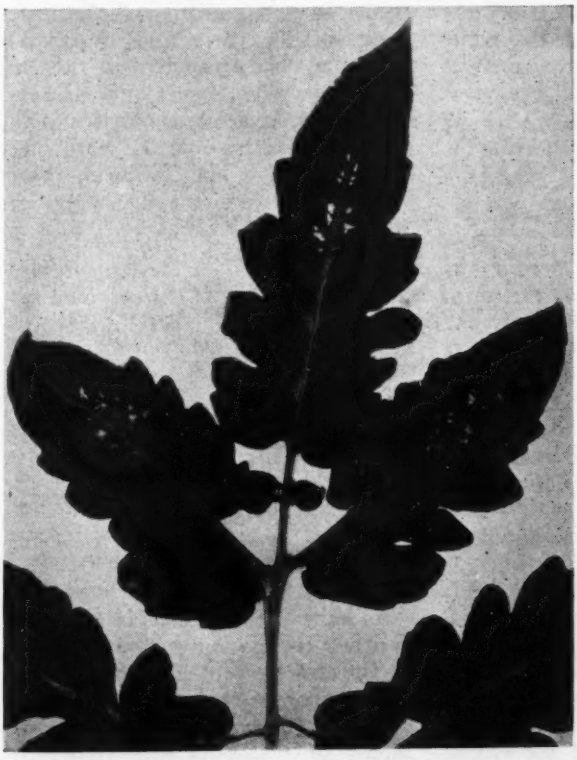


Fig. 3—An excessive or luxury feeding of phosphorus brings white, necrotic spotting on the leaves.

In extreme cases excess calcium causes a marked curling of the leaves which are harsh and brittle in texture; necrotic spots appear on the lower leaves, whitish yellow in colour and characterized by concentric water-marked circles. These areas are similar to those produced by a deficiency of magnesium.

The symptoms detailed above do not include all deficiencies and excesses studied

but those most likely to be encountered in tomato growing. Among those described probably excess calcium is the least likely to be of trouble with the tomato plant. Excess nitrogen is probably the most frequently encountered and one of the causes of severe losses in tomatoes due to physiological disorders of the fruit. In greenhouses lack of balance between nitrogen and potassium is a common trouble producing considerable plant debility, easily corrected by increasing the potassium applications.

Peculiarly enough we have obtained death of the plant from luxury feeding of phosphorus more easily than from the excess feeding of any other element.

In sand cultures we found that a ratio of 1.5 of P_2O_5 to 1 of K_2O in the nutrient solution to be satisfactory. Increasing this ratio to 3 of P_2O_5 to 1 of K_2O gave a definite depression in yield and vigor, while a ratio of 4.5 to 1 produced definite foliage injuries as described. A ratio of 7.5 of P_2O_5 to 1 of K_2O brought about the death of the plants.

Balanced Ratios

In the case of excess feeding of nitrogen, foliage injury in the form of chlorosis and burning of the lower leaves was produced with a N/K_2O ratio of 4.5 to 1. Widening this ratio to 9 to 1 caused the injury to be much more severe, with lesion-like patches on the stems and petioles but without causing the death of the plant.

Whilst it is not recommended to feed excess nitrogen at any time, it should be pointed out that there is a definite danger in supplying excessive quantities of phosphorus especially when the potassium is not at a high level. In sand cultures, it would appear that the N/K_2O and the P/K_2O ratios should not exceed 1.5 to 1. In sand cultures even lowering the P_2O_5 content considerably did not produce any signs of phosphorus deficiency.

In other words, on a sterile soil, the above ratios have been found approximately correct. On regularly cultivated areas, the factors which would necessitate a change in this ratio would be the availability of the plant foods in the soil, but with a soil well supplied with available phosphorus it would appear undesirable to increase the phosphorus content of a fertilizer much beyond that of the potassium.

Nitrogen-Potash Ratio

To produce an extremely vigorous tomato plant free of foliage disorders is a comparatively simple matter. The minimum amount of all elements plus a large amount of nitrogen with a corresponding amount of potassium will accomplish this. In other words, the maintenance of the correct ratio between potassium and nitrogen is the important factor. Such plants will also produce a large crop of fruit but probably severely affected with blossom-end rot. The following table sets this forth more fully:

	Yield in oz. per plant	*% blossom-end rot*
Normal Solution...	57.0	1.6
Normal Solution + 2 × (nitrogen + potassium).....	83.1	26.9
Normal Solution + 3 × (nitrogen + potassium).....	87.2	47.5
Normal Solution + 4 × (nitrogen + potassium).....	90.8	59.3

In other words there is a definite positive correlation between susceptibility to blossom-end rot and extreme vigor of the plant. Since this vigor is dependent upon a high supply of nitrogen, it is considered that heavy applications of a nitrog-

enous fertilizer at any one time are contributory to this trouble. It would probably be advisable to commence with a soil which is not extremely rich in nitrogen but well supplied with minerals, and supply light dressings of nitrogen as the growth of the plants indicates the necessity.

The source of nitrogen also has an effect upon the susceptibility of plants to this trouble. It would appear that quickly available sources of nitrogen are more dangerous than more slowly available forms. Results from the Experimental Farm at Sidney, B. C., show that the former produced three times the amount of blossom-end rot as produced by the latter supplying an equal amount of nitrogen.

Susceptibility to blossom-end rot is also influenced by season or length of day. Plants handled in an identical manner and fed the same nutrients have significantly different percentages of infection when grown during different seasons of the year. Thus a nutritional treatment, which produced 57 per cent infection with plants grown from February to May, produced only 17 per cent infection with plants grown from July to September. The following table further emphasizes this point.

Date of Fruiting	*% Blossom-End Rot*
April 16	100
25	83.7
30	47.0
May 4	32.9
9	21.2
14	22.5
19	22.2
26	14.3

Susceptibility to this trouble is markedly increased during a short day period and especial care should be taken to avoid undue forcing of growth by the excessive use of nitrogenous fertilizers. During dull weather tomato plants require a good deal of potash and little nitrogen and may employ much nitrogen with somewhat less potash in fine, sunny weather.

Learning from Club Yields

(*From page* 17)

food availability is low and highly acid soils which carry an abundance of phosphorus-fixing elements such as iron and aluminum need a high-phosphorus formula. John Jackson & Son of Colebrook, New Hampshire, recognize this need and have twice won the state cup for producing the highest yield. In 1931 they broadcast a half ton of superphosphate in addition to their regular fertilizer and secured a yield of 506 bushels per acre. In 1934 they applied a half ton of basic slag with a resulting yield of 532 bushels, which is the club record to date.

Potash, as well as phosphorus, comes in for its inning. On the river valley soils and on soils that do not exhibit extremely acid conditions, this element is used perhaps more abundantly than phosphorus, in analyses like the 4-6-10 or 8-12-20. Where the soil needs are not definitely known, it appears wise for a grower to keep the phosphoric acid and potash on the same level in amounts ranging from two to three times that of the nitrogen content of the fertilizer.

About half of the growers have used double or multiple-strength fertilizers, such as an 8-16-14 or 8-16-16, while the others have applied materials approximating 20 units of plant food. Yields for the two groups are not vastly different, with double-

strength users slightly in the lead so far. There may be cases where low-analysis goods are preferable, such as very light soils demanding much organic material. But with a substantial price differential, the high-powered goods have a strong appeal, especially in the face of low potato prices.

The one question, aside from fertilizer, that has been most largely discussed in 300-bushel club circles is whether it is better to spray or dust. Advocates of dusting shout loudly and proclaim their method is best, while spraying devotees adhere just as strongly to applying their vine protection wet.

A study of the records does not reveal much advantage in yield for either method. From the data available we gather that 115 men have sprayed, with an average yield of 388 bushels per acre; while 62 that have dusted have grown 381 bushels per acre. Certainly neither group has much advantage. The men who sprayed have had to go over their fields slightly oftener than those who dusted.

Less Labor in Dusting

From the viewpoint of practicability, spraying gives a grower cheaper material cost, while dusting necessitates considerably less labor. When other farm work presses, dusting can be done in early morning or in the evening when the dew is on the vines or just before it condenses. Spraying on the other hand, necessitates an abundant water supply, and while most growers concede that spraying is preferable in combating early blight, the lack of water often forces a farmer to dust when otherwise he might prefer to spray. The use of home-made dust mixers or inexpensive purchased outfits enables dust users to cut their material costs about 40 per cent, and most of the men who prefer or have been forced to use dust mix their own materials. These have proved very satisfactory.

There is a growing tendency to use more lime in dusts and sprays in order to get a better shading of the potato leaves. Tip-burn, hopper-burn, the effects of flea beetles, and early blight can be partially controlled if a shading of the leaves is effected. A coating of lime on the leaves is the method of producing there a partial shade.

There is no debate about whether to apply materials to control insects and disease. All over New Hampshire this practice is universal. Growers are tending to start somewhat earlier and to get on more applications of spray or dust than formerly were made. Leaf-hopper and flea-beetle ravages of late years have made the growers more conscious of this necessity.

The use of certified seed is one practice that is well-nigh universal. Even in the northern part of the state where the climate is almost ideal for the potato crop, the custom is to get at least enough good seed each year to produce the potatoes for the following year's crop. In southern New Hampshire where the climate is not so ideal and where insects that spread virus diseases are more abundant, new seed is bought practically every year. In fact, about 40 per cent of the entire potato acreage of the state is annually planted to certified seed and about 90 per cent of the acreage is planted to potatoes that are not more than one year from certification.

Competition Holds Interest

Most of the larger potato growers of the state are or have been at one time enrolled in the 300-bushel club of New Hampshire. Many have entered and failed the first time, but came back to win the coveted honor, after their mistakes were pointed out.

A few growers have entered year after year and enjoy enviable records in the club history. H. E. Webster of Franklin has been in the club seven times and has an average yield of

423 bushels per acre. Burton A. Corbett and John Jackson and Son of Colebrook have been in the club six years and have an average yield of 446 and 445 bushels, respectively. R. W. Dunbar of Warren has a six-year record of 385 bushels. W. G. White and M. R. Young of North Haverhill have five-year averages of 408 and 411 bushels, respectively. H. G. Burns and Son of Milford, New Hampshire, have succeeded in growing 439 bushels over a four-year period.

The responsiveness of these growers to new and better methods is one of the outstanding features of the 300-bushel club. They form today the backbone of potato improvement work in New Hampshire and have been in the forefront in the marketing organizations that have been perfected to dispose of the certified seed and table stock crops.

Winter Cover Crops for the South

(*From page* 20)

for an indefinite time if annually allowed to mature, winter peas usually are destroyed by insects in late spring and may not be depended upon to reseed at all. In common practice the seed for both vetch and peas are usually purchased and sown each fall, almost solely for their soil-enriching properties.

While these common winter legumes have the ability to get their nitrogen from the air, they have no such power to obtain the mineral plant foods and it is quite essential to success that these minerals be supplied. Numerous tests over Mississippi by the Soils Department of the Experiment Station, as well as by similar work fostered by the Tennessee Valley Authority, have shown that the growth of these winter legumes has been materially increased by the use of the mineral plant foods where they are deficient in the soil for the regular summer crops. Also it has been shown that the inoculation of the seed before planting is even more essential, bur clover being the exception because it carries its own inoculation when raked from the soil and saved in the bur, as is the customary practice.

The successful growing of winter cover crops is no longer an experiment and no one doubts the advisability of the practice, but many handicaps stand in the way of its extension to the South as a whole. One of the greatest of these handicaps is the fact that so many of our fields remain unfenced, and, even where stock laws prevail, animals roam at large over the fields during the winter. Another deterrent is the rather heavy cost of annual seeding and the difficulty in dry falls of getting the seed to germinate early enough to become well rooted before the occasional winter freezes. At best the education of the farmers to the point of getting winter cover crops started has been slow, but the increase, in 18 years, from 50,000 pounds to 6,500,000 pounds of seed planted in a single season, the record of one state, is certainly proof of the fact that the work is progressing and merits the consideration of the farmers as a whole. Certainly no such numbers of them ever could have been induced to this practice if the earlier trials had not proven profitable.

Based on the sound experience of thousands of farmers who have tried it, the growing of winter legumes seems one sure way of building and maintaining soil fertility in the South. We have not been able, and can never expect, to maintain soil fertility under

a system of clean-cultured crops like cotton so long as the bare soils are left in winter to the mercy of our heavy rainfalls, unprotected and without the roots of plants to hold the soil particles intact as well as to take up and store the plant foods that become available.

Any winter cover will do this much and will to this extent prove valuable. However, when at the same time it will store the equivalent in nitrogen of hundreds of pounds of our common nitrogen carriers, we can scarcely afford to substitute the non-legumes for the legumes, or to plant oats, rye, or wheat rather than vetch, winter peas, or several of the clovers.

New Laws, Ideas, Enterprises

(*From page* 14)

ways send "repeat" orders. He sells in four grades, the 12, 13, 14, and 15 centimeter sizes, and does not bother to pick out the extremely large 16 and 17 centimeter bulbs because the extra money he would get for them does not pay for the time and trouble it takes to get them out. Small bulbs and the splits and slabs, he uses for seed and finds them very satisfactory. Some growers tell him that he should get 200,000 bulbs from an acre, but he is satisfied to get from 115,000 to 120,000. His yields may be smaller than those of other growers, but Mr. Geraty believes that they use a closer spacing than he does, and he is satisfied with a two for one increase.

Now comes the most "ticklish" part of the whole bulb proposition, that of curing them. Mr. Geraty places his bulbs in regular field boxes in the field. They are hauled to the curing shed. This building is wide open on all sides, with a wooden floor four feet from the ground, and the roof is very low hanging at the eaves. For the first two weeks, the bulbs are turned over and over, every second day, to prevent their molding or nesting and to keep the natural heat, which always is present in a newly dug root crop, from injuring them. During the next three weeks, they are turned at least twice a week, and after that once a week or ten days until they are sold. No artificial heat is used in the curing process, climatic conditions being such that air drying does the work very well.

Florists and householders of Charleston frequently drive to the Harrison farm to purchase flowers, but no systematic effort has ever been made to sell them. Mr. Harrison and Mr. Geraty are in the bulb business for bulbs, and it's your garden and my garden that benefit from these carefully grown products of a relatively new Southern enterprise.

Looking Backward

(*From page* 6)

"If cotton comes down to six cents, our case will be deplorable, but what can be substituted in its room?" inquires a worthy squire from the Middle Country. He notes that the ancestors of the planters during the revolution were more prosperous, and he asks if the present population had inherited their economy as they had the land. "Ask any old revolutionary inhabitant how many coaches, with their retinues, were

driven to the town; and if stick-a-back chairs, with servants in attendance, were then the common mode; or if there were any Balston spas, Saratoga springs, or tours to Canada by way of Niagara Falls, to drain the planters of their cash?"

Checking off the possible substitutes, this sage observes that the country was not suited to grain and that its overproduction in any event would mean a low price and a greater evil than six-cent cotton. "Grapes have not succeeded for want of proper treatment or the right kind." Silk he dismisses as equally futile. "If we resume growing indigo or tobacco, the amount of the first would supply the whole world without taking account of that grown elsewhere, while our lands are too much exhausted to attempt tobacco. To be sure we might again consider cane, as molasses, syrup and rum may be made from it," the old scribe continues, "but in the former we shall be rivalled by the West Indies; and the whiskey taste and temperance societies will destroy any expectation we may have from rum." (Sort of betwixt the upper and nether millstones.) Hark now to his final blast: "The only recourse that presents itself is a *general retrenchment*—this, hard as it may appear, is the only relief to which we can resort." (Did this philosopher vision the era of 1935?)

IN THEIR extremity, the planters discussed freely on public occasion such topics as whether more livestock would be an advantage along with cotton and corn, and argued the merit of introducing the plow to the lowlands where sea-island cotton was listed by slaves with hoes.

"Where cotton is the principal crop, the raising of any kind of stock is impracticable as a matter of profit," writes another truculent planter. "With little cessation from labor in preparation of cotton and corn, how then is the force employed to find time for stock? Where are the shelters to protect them from inclemency or the forage to sustain them? Look at the skeleton appearance of the cattle in March, hardly tempting enough for the turkey-buzzard as he soars by in search of prey." Taking opposite view, a few others cannily point out that much manure for land improvement and much provisions would be returned by live stock; but as a rule their opinion was in the sad minority.

ONE of the rare articles revealing the social customs of the time came from the quill of W. W. Hazzard of Georgia. It discussed the paternal management system of plantations. One bit from this morsel is enlightening in these days of so much solicitude for the unemployed, the infirm, and the aged. He relates that it was his daily custom to take counsel with the Negroes concerning their relations with himself. "I assure them," he writes, "the laws of the land have secured to them rights which the master dare not violate without risk of incurring heavy penalty or imprisonment in the penitentiary; and that it is the duty of the courts on receiving information on oath of any infirm slave being in suffering situation from neglect, to make inquiry and render such relief as they in their discretion may deem proper." Then he winds up with the climax: "This protection which our laws have provided for them in their old age and infirmity, Europe and the Northern states have never extended to the poor old white man!"

Much as the high duties on imported manufactured articles imposed by the tariff blistered the minds of the agricultural South, eventually leading to the famous Nullification Act, one finds less impatient discussion of that hated measure in the farm press than of the more fundamental topic—land deterioration.

Some contributors of original papers saw clearly that some day the opportunity to abandon worn-out plantations and move farther West into the fertile reaches of Arkansas, Missouri, Texas, and Tennessee would be ended; and they besought the people to remain in the old colonies and improve their heritage by scientific farming. As we scan the pages of those budding times in the light of our modern knowledge of soil conservation and chemical restoratives, we admit that it would have required heaps of courage to stay in Georgia and the Carolinas, depending on the meager and conflicting experiments with limited fertilizing materials, when vast empires awaited the settler's plow and hoe within the borders of our domain.

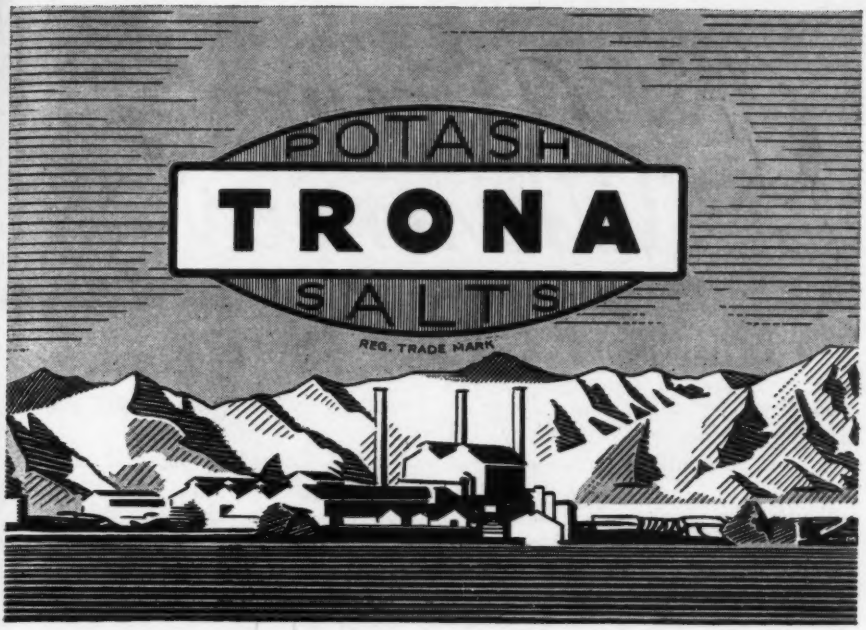
YET there is pitiful logic and hopeless common sense found in vain pleas of the elders to keep their sons and daughters content in the land of their birth. They acknowledged that the "fatal impediment" to successful farming was indifference and aversion to technical reading, and the absence of schools and experiment stations.

One who takes the pen-name of Highlander undertakes to strike at this obstruction, and he writes: "Our farms are going rapidly into hopeless sterility and if cotton should double in present value, the prospect before us would be scarcely less gloomy." Then he clinches it by adding: "The planter whose worn-out fields produce nothing for sale can have but little choice between high and low prices. Within the range of my acquaintance there are planters who, by means of fresh soil, great industry, rigid economy, and a convenient market, realize an annual income of eight, ten or even twelve per cent on the capital employed; others hardly one per cent, and some tending to pauperism."

In a final gesture of resignation, Highlander writes: "There is scarcely anywhere in the United States a more robust, active and laborious yeomanry than is found in the upper country of the Carolinas and Georgia. Give them good soil and stimulating prices and no people can out-crop them. But they are for the most part as unused, and as disinclined to give attention to manuring as their predecessors, the Catawbas, Creeks and Cherokees." Then he closes with eloquent phrases: "Perhaps some one more sagacious or resolute than the rest may already have made a lucky experiment demonstrating the feasibility of retrieving an exhausted cotton field, or preserving its pristine fertility. If so, in the name of patriotism let him speak, let him give us the ways and means in detail, so that we may bring up our paternal estates to a condition of profitable use; or on that dire alternative, an inglorious flight to the woods, wilds, and durances of the Southern and Western frontier."

NOWADAYS we have no foreboding about losing our offspring to the call of the virgin acres. There are no more rainbows in the Western sky for youth to reach for in search of the golden harvest. Just as the story in the Bluebird tells us, we may quit seeking far and long for the horn of plenty locked in the bosom of earth. Our happiness lies in our own convenient meadow, ready to spring forth under the wand of science and practice. The hoar frost and the dew point the way afield to our own "acres of diamonds," the domestic wealth and content which those sages of a century ago dreamed of, but never realized.

I wonder if, in 2035, the delver in the dust of ancient times of our own day will regard *us* as constructive planners, purposeful writers, discerning philosophers? Modesty and lack of space forbid me to answer.



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COMPENSATION?

A Negro preacher was talking to his congregation about salvation. Finally his sermon was finished, and then he said, "Now, Brother Smith, will you take up the collection?"

At this point an elderly man got up and started for the door, saying, "Parson, Ah thought you said salvation was free—free as the water we drink."

"Well, brother," replied the preacher, "salvation is free and water is free, but when we pipes it to you, you has to pay fo' de pipin'."

Mother—"Now, do you know where bad little girls go to?"

Molly—"Oh, yes—they go almost everywhere."

SURPRISE

He was at the fountain-pen counter making a purchase. "You see," he said, "I'm buying this for my wife."

"A surprise, eh?"

"I'll say so. She's expecting a Packard."

A man was fumbling at his keyhole in the small hours of the morning. A policeman saw his difficulty and came to the rescue.

"Can I help you to find the keyhole, sir?" he asked.

"Thash ald right, old man," said the other cheerily, "you just hold the house still and I can manage."

LOYAL ROOTER

Mother: "Now say your prayer, sonny, and go to sleep."

Little Dicky (a football enthusiast): "God bless Ma, God bless Pa, God bless me—rah! rah! rah!"

Lifeguard (with girl in arms): "Sir, I have just resuscitated your daughter."

Father: "Then, by Gad, you'll marry her!"

"Love makes the world go round."

"So does a good swallow of tobacco juice."

Drunk (bumping into lamp post): "Excuse me, sir." (Bumping into fire hydrant): "Excuse me little boy." (Bumping into second lamp post and sitting down): "Well I'll just sit here until the crowd passes."

DIPLOMACY

A colored country preacher, who was strong on visiting the female members of his flock, was traveling along the road to the home of one of his congregation when he met the small son of the lady member.

Parson: "Where's your mother?"

Small Negro: "She's home."

Parson: "Where's your paw?"

Small Negro: "He's home."

Parson: "Tell 'em howdy fuh me."

The NEED

QUOTED from an address delivered by C. A. Browne, Assistant Chief, Bureau of Chemistry and soils, U. S. Department of Agriculture:

"The maintenance of soil fertility can be accomplished only by restoring to the soil the equivalent of the plant food which has been removed with the harvested crop. . . . According to every criterion, there is an under-consumption of potash in American agriculture."

What more is there to say to those whose livelihood depends directly or indirectly upon agriculture?

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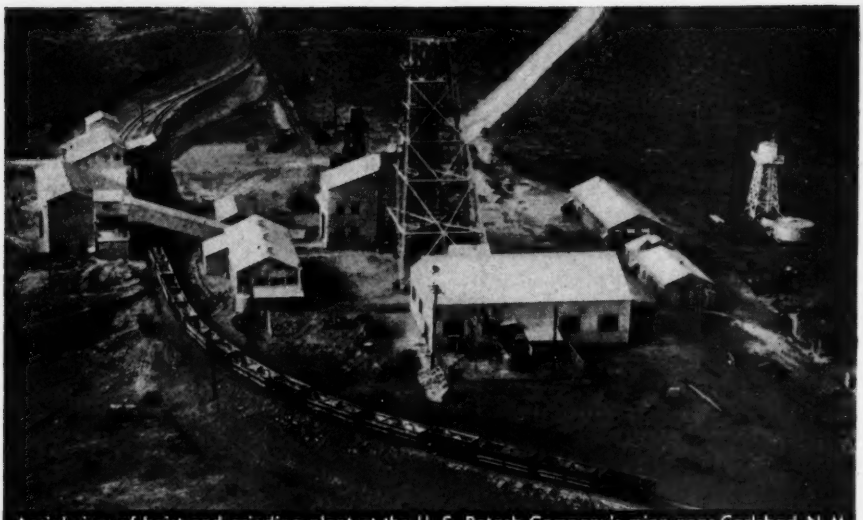

Aerial view of hoist and grinding plant at the U. S. Potash Company's mine near Carlsbad, N. M.

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